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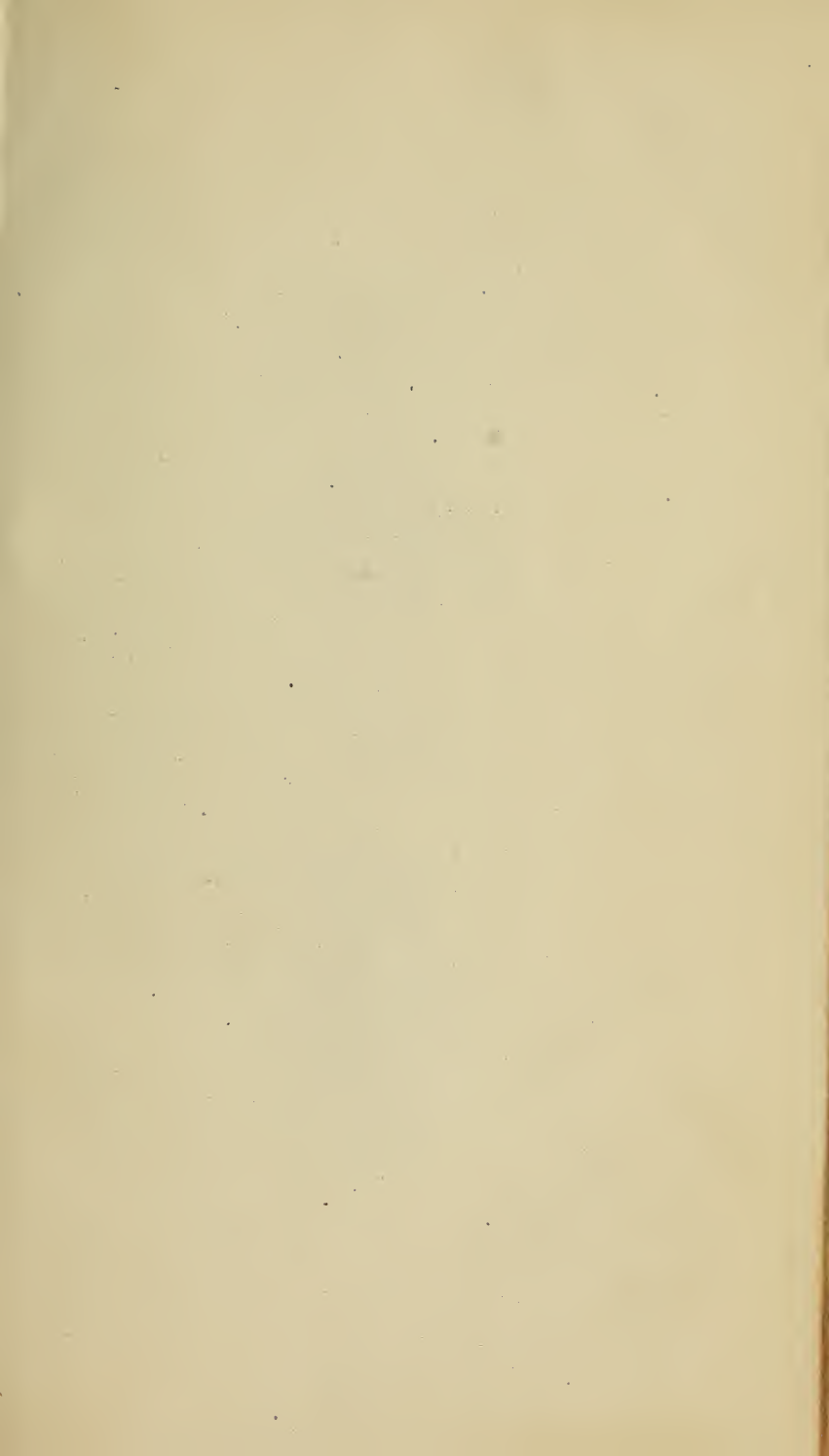
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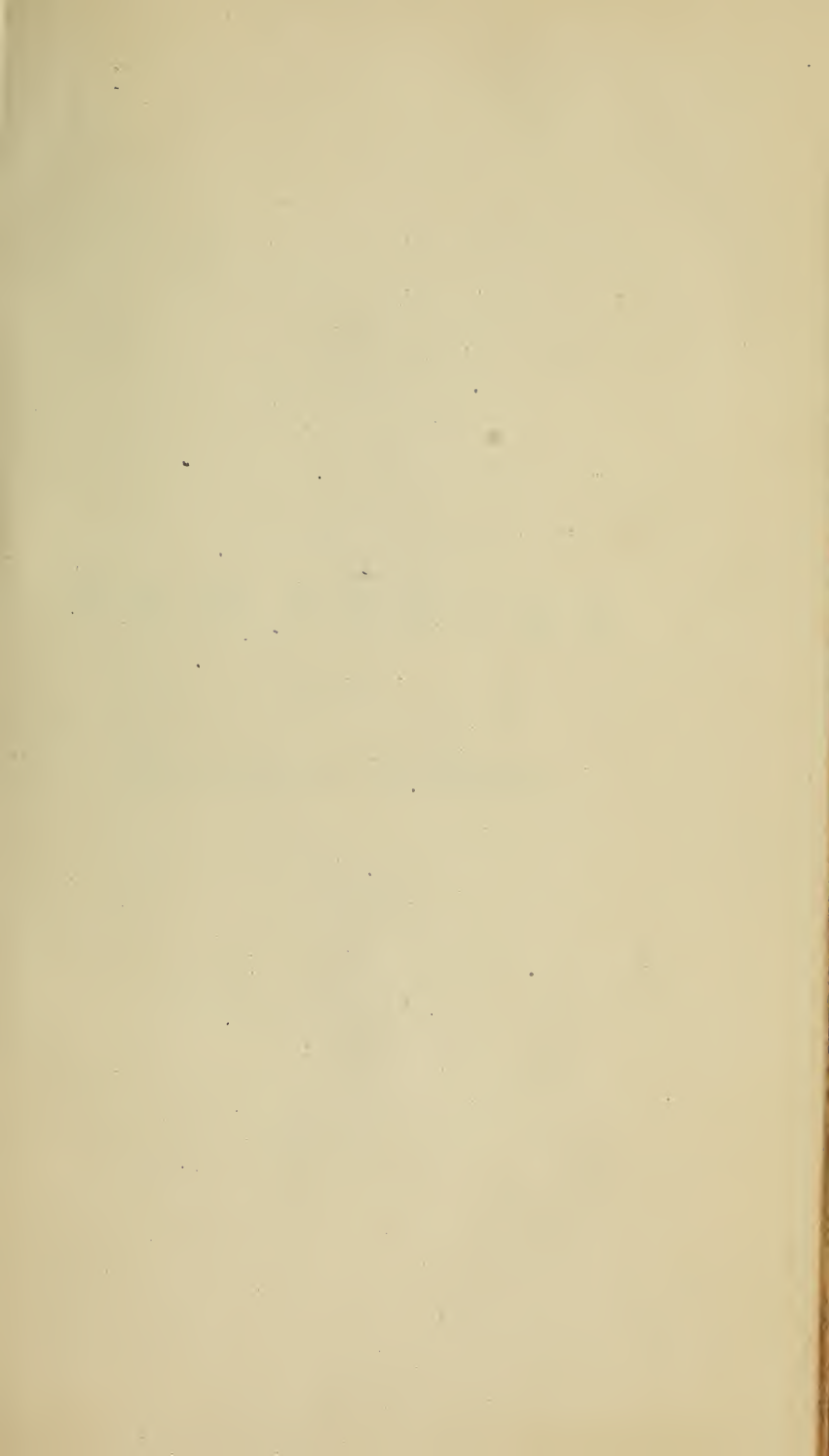
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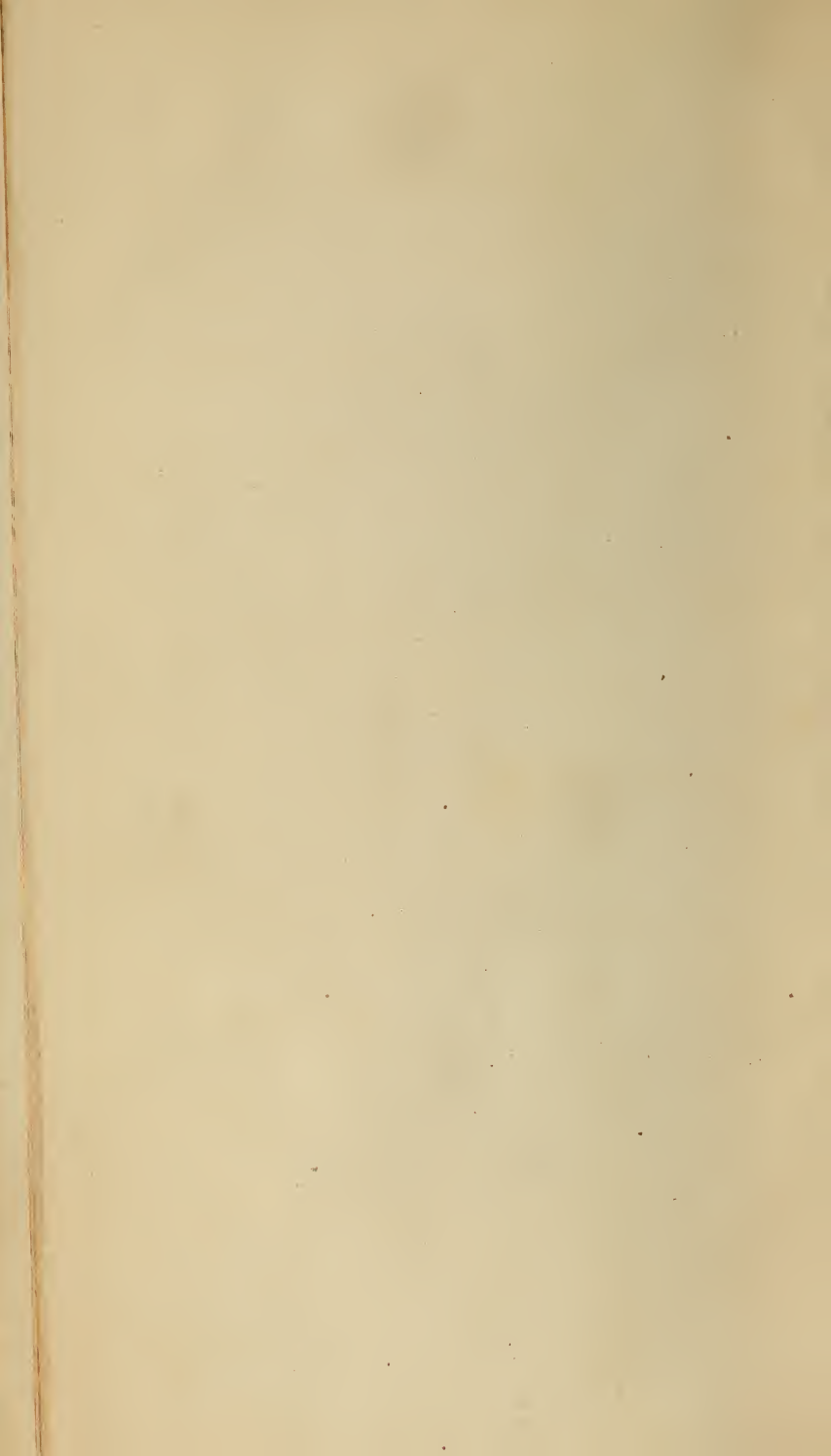
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UNITED STATES OF AMERICA.









A

NEW THEORY

OF THE

Formation of the Earth.



AN

ABSTRACT

OF A

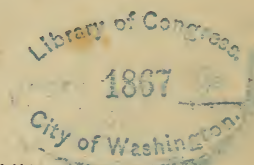
NEW THEORY

OF THE

Formation of the Earth.

BY IRA HILL, A. M.

“Study Nature; nature is a friend of truth”.....*Young.*



Baltimore:

PUBLISHED BY N. G. MAXWELL.

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1823.

BL 225

H5

DISTRICT OF MARYLAND, *to wit:*

BE IT REMEMBERED, That on the twenty-seventh day of August, in the forty-eighth year of the Independence of the United States of America, Ira Hill, of the said district, hath deposited in this office, the title of a book, the right whereof he claims as athor, in the words following, to wit:

* SEAL. *

"An Abstract of a New Theory of the Formation of the Earth, &c. By Ira Hill. A. M. 'Study nature; nature is a friend to truth.—*Young.*'"

In conformity to an act of the Congress of the United States, entitled "An act for the encouragement of learning, by securing the copies of maps charts and books, to the authors and proprietors of such copies, during the times therein mentioned;" and also the act, entitled, "An act supplementary to the act, entitled, 'An act for the encouragement of learning, by securing the copies of maps, charts and books, to the authors and proprietors of such copies, during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

PHILIP MOORE,
Clerk of the District of Maryland.

TO

GENERAL ANDREW JACKSON.

WITHOUT even your own consent, and without any other claims to your notice than those arising from an admiration of your virtues, I have ventured to place your name in the front of a work, the result of those hours of leisure that have been snatched from a laborious employment; a work that has for many years occupied my solitary studies. Retired as you now are from the desolating tempest of a military and the scarcely less exhausting commotions of political life, I can but flatter myself, that this intrusion will be pardoned—I can but flatter myself, that while the hand of the American Cincinnatus cultivates that soil which he formerly so gloriously and so successfully defended by his sword, he will rejoice to find so many spontaneous testimonies furnished by nature to the truth of the divine records, as are grouped together in the pages of this volume, all leading to one grand result, that the Divine Being whom we both worship, is alike consistent in his works and in his word.

That your countrymen may properly estimate your virtues, and testify their sense of services so important, by claiming for their candidate the first honours in the gift of a free people, is the sincere wish of your unknown friend and countryman,

THE AUTHOR.

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PREFACE.

IN giving the following brief sketch of his views of the formation of the earth, rocks, mountains, &c. the author is influenced by various motives.

He considers the study of nature of unlimited importance to every person, for in all the works of God, his glorious attributes are displayed; and if we but understand the language in which the volume of nature is written, we can at all times draw the richest instructions from every page.

We believe there is nothing in the works of God which contradicts his holy word, or there is nothing in the works of nature, but what perfectly coincides with scripture, and the only cause of the great difficulty in reconciling natural philosophy to scripture is our ignorance of one or the other of them.

The sceptic, the deist, or atheist, in possession of a few arguments, which he does not rightly comprehend, commences an attack on the word of God, which he is as ignorant of,

as he is of true philosophy. He assails such as are totally unacquainted with philosophy, and they are often obliged to retire from the field, because they have no weapons to defend themselves.

The infidel selects natural events recorded in scripture as arguments against the truth of the sacred volume, and if he cannot reconcile what he now sees with what he there reads, he condemns the whole as a forgery or an imposition upon mankind.

There is perhaps no fact recorded in scripture, which has been more successfully perverted to confound the multitude, than that of the universal deluge. The infidel says, "That it is a natural impossibility for the waters to cover all the high mountains; and the God of nature cannot work natural impossibilities." And if the waters could have been made to rise so high, where have they receded to?"

To remove many such difficulties is one object of the author.

The general mass of community, not being accustomed to read geological publications, and such works in general being voluminous, and frequently written in language which they cannot comprehend, the common classes of community on which the infidel makes his attacks, are unwilling to commence so arduous a task,

as to peruse extensive publications, filled with terms and phrases of which they are totally ignorant. Therefore, the author has endeavoured to give his ideas, in as brief and plain a manner as possible, that the work may not be too long for their perusal, nor too intricate for their comprehension.

The theory he claims as an original one, and it is with humble deference to the learned and scientific that he submits it to an enlightened public.

The most of the ideas contained in this work, have been submitted to the examination of those who are an honour to their country, and a blessing to the age which is illuminated by the splendour of their talents. They did not condemn them. As this theory was formed from observation, and not from perusing the works of the learned geologists, they advised, "That the facts recorded by Cuvier, Hutton, Werner, Playfair, &c. should be examined before the work should be submitted to public examination. Those authors have been attentively perused, and the numerous facts which they have collected, go so directly to strengthen the position we have taken, that it is with confidence that an *abstract* of the theory is brought to public view.

Drs. Samuel K. Jennings, and James Gray, whose philosophical and theological researches, are well known in this city, are the only persons in this part of the United States who have been made acquainted with the principles on which the theory is founded, and with the facts which are introduced to prove the premises correct. These learned gentlemen approve of the work, and recommend its publication.

The theory of which this work is an abstract, has been written a number of years, the principal heads of which were submitted to the examination of several of the distinguished literati of the northern section of our country. On my arrival here, I had the pleasure of perusing a work just published by Dr. H. H. Hayden, of this city, which, though we were entirely strangers to each other, and never heard of each other's views on the subject, goes almost directly to prove my theory, and demonstrates, as far as the nature of the subject will admit, the effects of the causes, which we attempt to explain. The numerous facts which he has collected, have thrown much light on our subject of which I have availed myself in a number of instances, and to his valuable work I respectfully refer my readers for

more proofs of the correctness of my theory, than the limits of mine will permit me to notice.

The author is well aware of the many difficulties attending the introduction of a work of this kind; a work which is in a degree opposed to the publications of many who have been ranked among the great men of the earth, but he is confident that truth, however plain may be her apparel and humble her appearance, will prevail.

Though systems of geology almost without number have been sent forth into the world, some of which darken more than they enlighten the mind, and instead of guiding the votaries of science to the temple of truth, bewilder them in the labyrinths of error, yet most of the theories have been useful. They have excited the human mind to inquiries, induced many to enter the extensive field of research, and have been the cause of many important discoveries.

Facts are the materials out of which theories are to be formed and supported. These materials may be so mutilated and changed, as to form a theory of almost any shape; but that theory must be best which is raised from the most simple facts, and supported by such as are gathered from the remotest parts of the earth. If we can construct an edifice of the

materials brought from the four quarters of the globe, and from the different isles of the ocean, and without alteration have them all unite as if wrought by the most skilful hand—Such an edifice will remain unshaken, however strong may be the force of prejudice, or violent the blasts of vain and false philosophy. Facts like witnesses have been tortured to testify in opposition to each other, and often in opposition to reason and truth. But if they will rise voluntarily and simply affirm in unison with each other, ought they not to be believed? If the *relics* and alluvia of Siberia, and of the other extensive section of Asia, voluntarily unite and testify with those of Africa, and the many which exist in Europe, and all appear in perfect harmony with the numerous phenomena of America, though contrary to theories formed from the facts of a small province, or kingdom, ought we not to believe? If the remains of marine and land animals, which are found on plains and mountains, and those which are imbedded in masses of solid rocks, come forth, with the bones of antedeluvian men, which are found in our own country; if all of these, with various other phenomena which have obstructed the progress of geological inquiry, be not only removed, but join in support of our theory, who will not be convinced of its correctness?

In a work so limited, it cannot be expected that we shall prove to a demonstration all propositions which may be advanced, but we calculate to give some substantial facts in proof of every statement.

We will take the word of God for our guide, reason and philosophy for our attendants, and supported by the many facts which have been brought to light, we trust to the candour of an enlightened public, and bid defiance to the ridicule of the sceptic, the scoffs of the theorist, the frowns of the superstitious, and the malice of the atheist.

The envious critic whose life is devoted to poisoning or destroying the fruits of others' labours, may writhe his hydra folds round every word, yet in an enlightened public we have confidence, and the public is the tribunal to which we are willing to submit the publication.

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FORMATION
OF
T H E E A R T H .

IN *the beginning God created the heaven and the earth.** The heaven here referred to, was doubtless the shining worlds which range the unlimited fields of ether, and which are so many grand theatres in which the glorious attributes of Deity are displayed. In the numbers of brilliant spheres, which then adorned the skies, we believe were included our sun, and all the planets which revolve around this splendid centre, except the earth and moon. But, since the period when God commanded the earth to appear, other planets, both primary and secondary, may have been created, and at the Almighty's command, more may spring into existence, and become the abodes of intelligence. Millions of splen-

Gen. i. i.

did systems may have adorned the heavens, and experienced the munificence of an all-wise Creator, and bountiful Benefactor, for myriads of centuries, before the Author of universal nature saw fit in his providence to form the sphere on which we live. From the word of God, we learn, that the heavens were created before the earth,* and no reference is given as to the space of time which intervened before our planet assumed its form.

The earth was without form and void.† This is indicative of the state in which the matter composing our earth existed, before God moulded it to be a habitable world. The matter which composes our sphere, then existed in a chaotic state, floating in the expanse of ether, unaffected by the laws of gravitation.

When God gave to this matter laws, which bound one particle to another, they rushed together, and a sphere was formed. The denser particles were most attracted, moved fastest towards the centre of the agitated mass, and propelled the lighter towards the surface. The particles composing the water being of less density than those of the earth, were forced towards the surface and covered

* God created the *heaven* and the *earth*. Gen. i. 1.

† Gen. i. 2.

the face of the globe. *Darkness was on the face of the deep.** The deep here alluded to could have been nothing but the expanse of waters which covered our sphere, and there being no light, we must conclude that the atmosphere, which is the medium of light, was not formed, or existed in so turbid a state, as not to admit the rays of light.

The spirit of God moved upon the face of the waters.† This passage clearly shows, that our planet was then covered with water. It is rational to conclude, that the atmosphere at that time was not so completely formed as to be transparent. The particles composing the fluid that surrounds the globe, were mingled with the denser ones, when our sphere was formed, or when the matter composing it consolidated. Then by the pressure of denser ones they were forced to rise. The aqueous particles were first propelled to cover the solid parts of the earth, and the æriform substances, according to their densities, embraced the waters without, as the waters enclosed the solids within.

And God said, Let there be light: and there was light.‡ At that time the atmosphere had become so divested of opaque particles,

* Gen. i. 2.

† Ibid.

‡ Gen. i. 3.

as to admit the rays of the sun to the surface of the earth. But it appears that the atmosphere did not for some time become so clear or transparent as to admit the feebler light of the stars. For, some time after God said, *Let there be light*, which was emitted from the sun, he caused the stars to shine.*

This would have been the case, had our globe and its garments been formed in the manner we have stated. A length of time would have been required for the finer particles, which compose our atmosphere, to be separated from the grosser ones, which are in the earth and on its surface. It is rational to suppose, that the atmosphere for some time would be loaded with vapours that the reflected light of the planets, and the twinkling rays of the stars, could not reach the surface of the earth; but the more copious beams of the sun would sooner perforate the vapours, and give day to half the sphere, as now we are not deprived of his light, though our hemisphere it thickly shrouded in clouds.

Thus far do reason and revelation perfectly coincide; and further still does the sacred Word prove the accuracy of the positions we have taken. That the earth was first covered with waters, appears evident from the ninth

* Gen. i. 14.

verse of the history of the creation.—*And God said, Let the waters under the heavens be gathered together in one place;—and God called the dry land earth, and the gathering together of the waters called he seas.**

When the earth by the command of the Almighty, was fashioned to a sphere, there were no rocks nor stones in the whole confused mass. This appears from many facts, and from reason. Many rocks contain animal and vegetable remains.† The various species whose relics are deposited in rocks, must have had an existence previous to the existence of the rocks in their present form. If the rocks were formed when the world was, these animals must have lived before the world was created. Animal and vegetable remains are found only in rocks termed *secondary*. That those denominated *primitive*, though they contain no *relics*, were not formed as they now exist, when the world was created, appears from reason.

If matter, when in a chaotic state, possessed power of attraction sufficient to form rocks, those rocks would have attracted more mat-

* Gen. i, 9.

† Animal and vegetable remains being so frequently found in solid masses of rocks, in almost every section of the world; and so frequently mentioned by all geologists, that it is unnecessary to make any direct reference to prove what can be doubted by none.

ter to them, the attraction would have increased in proportion to the matter consolidated, a world would have been formed immediately; and all the rocks would have been precipitated to the centre of the globe. Therefore, if the primitive rocks existed before the law was given, which binds one particle to another, the rocks being denser than the earthy particles, would leave the latter nearer the surface, and no *primitive* rocks would be found near the circumference of our globe. But immense masses of *primitive* rocks are found not only on lighter particles beneath the earth's surface, but even on the surface, and they crown the summits of the highest mountains. These could not have been their situation, had they existed in their present state when the globe was summoned to appear as an habitation for the living. Therefore, we shall conclude that *no* rocks were formed when the world was, but that the denser particles were nearer the centre, and the rarer propelled towards the surface, and the whole covered with water as with a mantle, and the still rarer particles which compose the atmosphere, united above to warm, protect, and enlighten the whole.

Having premised the manner in which we conceive it pleased the Almighty to fashion

our world, when he called it from chaos, it remains to point out the various causes which he employed as his agents, to produce the many effects now witnessed in every country on the globe.

All the elements are servants of God. They all have laws by which they are regulated, and bounds to which they are limited; beyond which they never pass, but by his supreme command. God works by means in the natural as well as in the moral world. When he had formed the world by his laws, when *darkness was on the face of the deep, when the spirit of the Lord moved on the face of the waters*, when he would cause the dry land to appear, the means which the great Architect of nature would employ to accomplish so great a work must be worthy of the attention of all.

Water, fire, and air,* are the agents by which the Almighty carries on his wonderful operation on our sphere. In the different combinations, and motions of these servants of God, we are to look for the causes of all the effects and catastrophes which our planet has experienced. The water and air, encompassing the solid parts of the earth, equally affect-

* In the word *air* we comprehend the various *gasses* which are found to unite in the atmosphere. As our object is to give a brief view of our theory, in a manner that can be comprehended by all, we shall avoid running into chymical *minutiae*.

ed its surface, that we cannot conceive that either one, or both of these could have produced the great effects which we witness in the solid parts of the earth, in every section of country which has been explored.

Then it is to heat or fire that we are to look for the powerful agent which has often revolutionized our world, raised lands from beneath the ocean, elevated mountains, formed many of the rocks and caused the surface of our globe to assume so different an appearance, from what it bore when the Lord commanded the dry land to appear. Water and air have produced some changes on the surface of the earth, to which we shall occasionally refer, but as fire has been the most active agent, in bringing about the revolutions which are visible to every inquiring mind that surveys the works of nature, to that we shall assign the principal effects which appear, and by that we shall attempt to account for many of the phenomena which have excited the attention of the philosophic world.

When we survey the surface of our planet we cannot indulge a thought, but it has undergone many great, and important changes. The rocks, the mountains, the hills, and vallies; the plains, and the ocean itself, declare it. The changes wrought by water and air, have

been small, compared to those which are the effects of fire. Water and air continue their operations daily, in depressing mountains, and elevating vallies. The shattered state of rocks, precipices, and mountains, declares that what gave them their positions, was sudden, violent, and from beneath. This cause was fire.

Heat causes matter to expand, and if once excited will increase in power till it forces its way to a rarer medium. When the world was fashioned, the concussion of particles of matter in consolidating would produce heat. This heat generated, perhaps, several miles beneath the bed of the ocean by its own force, prepared combustion around its focal point, and bound by a thick covering of earth and water, must have acquired an immense power before it could raise its incumbent load. The matter which was most exposed to this vast furnace of nature, became liquified. When the ocean of fire within had acquired strength to elevate the mass above, the bottom of the ocean was raised to mountainous heights, and the liquified matter, as it was exposed to water and air, consolidated into masses of what are denominated *primitive* rocks. Thus were formed the masses of granite, which are the basis of the most elevated lands, which crown the summits of the highest mountains, and are scatter-

ed in precipices, and in less fragments over various parts of the earth. As the bottom of the ocean was raised, and the rarified particles ascended into the atmosphere, the waters rushed into the vast abyss, and mountains, hills, and plains, were supported on the shattered arches. *Thus the waters were gathered together, and thus the dry land was made to appear.*

Rocks have been formed by three different processes of nature.

1st. Those denominated *primitive*, were formed by heat, as has been stated, when the matter was so exposed to internal fires as to become liquified.

2nd. Those ranked under the appellation of *secondary* rocks, or such as contain the *relics* of animals or vegetables, were formed by particles becoming denser than water settling to the bottom of the ocean, and long remaining there in a quiescent state, consolidated into massive strata.* Shells of fishes, and

* Many substances denominated solids will float for a length of time in the water, and then sink. The matter composing such bodies are of a greater weight than the same bulk of water, but they are buoyed up by the air which is contained in the pores. The action of water on the particles, contracts them and expels the air, that the surface is diminished, and not containing a sufficient quantity of the fluid rarer than the water to support it, the body, according to the laws of gravitation, is drawn to the bottom of the water. Water in some bodies, as in ice in the spring, expels the air by pressing into the pores, and

even fishes themselves become embodied in these strata before they were raised from the bed of the ocean.

3d. Are those which are formed in the earth by similar particles of matter coming in contact, by agency of water, or otherwise, long remaining at rest till particle adheres to particle, and rocks are formed. Of such are the petrifications found in the earth, and several species of sand, stone, &c.*

The rocks which contain marine *relics*, vegetables, and even the remains of land animals, will first demand our attention.

That these were formed in the bottom of the ocean, appears evident from the many facts which we have on record, and from those which must have fallen under the observation of every person.

In the lowest stratum of secondary rocks are found no remains but those of fishes, or of

then the body is of more weight than the same extent of water, and it sinks. Hence green timber, while the pores are filled with sap, is heavier than when the moisture is expelled by rarification, and the pores are filled with air.

* The process carried on by nature in petrifications is curious, and simple as are all her works. As one particle of matter is removed by decay, or putrefaction in any animal or vegetable body at rest, where water continues to bring lime, or any calcarious particles, the place of the particle removed, is instantly occupied by the stony substance that the whole body retains its figure, though the substance is wholly changed. Hence are frequently found stones of exact similitude of plants, trees, reptiles, &c. and even the human frame, while reposing in the grave, has undergone this material change.

aquatic animals, and these remains are very different from any which are now known to exist. The changes which our planet has experienced, have produced changes in the species of animals, which were destined to inhabit the lands, or dwell beneath the waters. This appears evident from the fact, that the remains of many animals have been found, which bear but little resemblance to the same species at the present time, and many have been discovered, whose species and even genus have become extinct.

The organic remains found in the oldest secondary rocks, differ more from existing species than remains found in rocks of more recent formation.* This induces us to believe that the changes and catastrophes to which our world has been subject, have, by changing the properties or motions of the elements, pro-

* "Amidst these changes of the general fluid," says CUVIER, "it must have been almost impossible for the same kind of animals to have lived—nor did they do so in fact. Their species, and even genera, change with the strata, and although the same species occasionally recur at small distances, it is generally the case, that the shells of the ancient strata have forms peculiar to themselves; that they gradually disappear, till they are not to be seen at all in the recent strata, still less in the existing seas, in which indeed we never discover their corresponding species, and where several species of their genera are not to be found. That, on the contrary, the shells of the recent, resemble, as it respects the genus, those which exist in the sea; and that in the last formed and loosest of these strata, there are some species, which the eye of the most expert naturalist cannot distinguish from those which at present inhabit the ocean."—Page 55.

duced essential changes in the form, constitutions, and habits of the animal creation.

The organic remains found in the most ancient secondary rocks, are wholly of the marine kind, and from their shape we are induced to believe, that when they lived they were in their rudest state. These inhabited the waters before the Lord *commanded the dry land to appear*. We are led to this belief by the fact, that no remains of land animals, nor of vegetables, are found in the strata containing these *relics*.

Before the first lands were raised from the ocean, there were no currents in the waters as there now are. This will be hereafter explained. Then the waters were not agitated by the winds, tides, nor tempests, as they now are. Then the inhabitants of the waters had no tides nor currents to encounter as they now have. They remained in a quiescent state, died, their remains settled to the bottom of the ocean, there undisturbed by any agitation of the waters, their relics petrified,* or cover-

* It is a well known fact, that in caves where there is no circulation of air, that many petrifications are found. Likewise in graves, which are filled with water impregnated with lime, where there is no current, the human body has in a few years been converted into solid marble. It is evident, that if there were no tides nor waves in the ocean, the same process would be carried on at the bottom, and it cannot be surprising that we find masses of secondary rocks some hundred feet in thickness.

ed by other particles cemented into rocks.— When, by internal fires, the solid foundations of the deep were elevated to be the abode of nobler animals, these relics were projected far from the depths where they had long reposed, and crown the summits of our hills and mountains. When dry land appeared, which was the Eastern continent, currents in the ocean in a degree commenced. Rivers began to flow, winds began to agitate the surface of the waters, and the tides moved regularly to and from the new born land. The waters were kept in motion to a greater depth near the continent than at a distance from the shore. Then the inhabitants of the deep were forced to oppose the currents; they were impelled to greater action, and their strength, shape, and motions were formed for the sphere which they were destined to fill. Then many species, and perhaps genera, became extinct * Among the numerous remains which were deposited prior to this period, no appearance of land animals nor of vegetable have been discovered, and there are no vestiges of aquatic animals or fishes, whose shape would indicate that they had ever been engaged in stemming the rapid currents of tides or rivers.†

* Vide Cuvier, from page 118 to 129.

† That a change should be effected in the animal creation, by currents, &c. may appear doubtful on a partial view of this subject. But

The Eastern continent, or a greater part of it, and perhaps much more than what now remains above the waters, was raised when God commanded the seas to retire. Then vegetation was caused to grow, and animals designed for the use and convenience of man were created. As vegetables were torn from the soil, and as animals died, some of each were transported by rivers to the ocean. These remains were borne by marine currents to various distances from the land, settled, mingled with other matter, and cemented into rocks.

When there was but one continent, the marine currents were different from their present courses. Then the waters were raised highest near the coasts, and flowed to the east from the eastern shores of Asia and Africa, and to the west from the western coasts of Africa and Europe. These currents transported to different distances in the ocean the deposits which rivers committed to their charge; and as they moved from the continent, their velocity

when we reflect that no other change but that of climate will produce a great change in animal shape and economy, we must believe that a change in climate, in food, in exercise, in the air and water would have a much greater effect. Those animals which were incapable of such a change perished, and such species as could endure this *metamorphosis* and subsequent catastrophes, have extended their lineage to the present time. Fishes which have been the inmates of salt water, and removed to fresh, experience an essential change in their forms and habits. See Dr. Samuel Mitchill, *Notes on Cuvier*, p. 331.

diminished, and the remains they bore settled at different distances from the shore according to their densities. As these currents returned towards the continent twice each day the *debris* and remains they carried from the land, could not be transported round the globe. The waters remained nearly at rest on the side of the earth opposite to the continent.

Thus continued the grand process of nature in forming rocks, for the support of lands and mountains, for the benefit of future generations, till *one thousand six hundred and fifty years* after man was created, when the Almighty, in justice, caused a still greater change to be effected on the surface of our planet. The old continent groaned under the burden of iniquity. That Being whose all penetrating eye beholds the actions and thoughts of all, would suffer no longer such vices to prevail. To his faithful servant he revealed his will, and provided means for the preservation of those who were to re-people the world. To accomplish this work of justice, and to render our planet a more extensive theatre, in which his glorious attributes were to be displayed, *God caused a new continent to appear*. Again, He commissioned his servant FIRE to exert his strength far beneath the bed of the ocean. While Noah was building the Ark, the fire was gathering

power to accomplish his wonderful task. When the chosen few were in safety, when the appointed time arrived for nature to be confounded, the command was given for a new continent to appear. The greater part of AMERICA arose. The ascensions produced the universal deluge, as will be hereafter clearly elucidated. This produced a residence for millions of intelligent beings, and occasioned changes in the economy, and order of the elements, and no less revolution in the formation and duration of the animal and vegetable kingdom. Since that period when most of America emerged from the deep, the north-eastern part of our continent has been raised, and produced a deluge similar, though less extensive than that in which all flesh suffered. Other like catastrophes have taken place in our world at various periods, which will claim our attention in their proper places.

Having briefly introduced our theory of the formation of the earth, rocks, mountains, &c., we will attempt to bring facts to prove that the premises we have assumed are correct. But in giving merely an abstract of a theory it cannot be expected that we should introduce all the facts which have been brought to light by the ingenious and enterprising Geologists. A simple relation of facts, which go directly to

prove the correctness of our theory, would afford matter for volumes. Therefore, we shall have recourse but to few, and to such as are most generally known.

In commencing with the proofs to establish our theory, we are induced to make use of some preliminary remarks of the illustrious Cuvier. "When the traveller passes through those fertile plains where gently flowing streams nourish in their course an abundant vegetation, and where the soil is inhabited by a numerous population, adorned with flourishing villages, opulent cities, and superb monuments, is never disturbed except by the ravages of war, and the oppression of tyrants, he is not led to suspect that nature has also had her intestine wars, and that the surface of our globe has been much convulsed by successive revolutions, and various catastrophes. But his ideas change as soon as he digs into that soil which presents such a peaceful aspect, or ascends the hills which border on the plains, and they begin to embrace the full extent and grandeur of those ancient events to which I have alluded; when he climbs the more elevated chains whose base is skirted by these first hills, or when, by following the beds of descending torrents, he

penetrates into their interior structure, which is thus laid open to his inspection." *Cuvier's Theory*, p. 30.

FIRST PROOF OF REVOLUTIONS ON THE SURFACE OF THE GLOBE.

The lowest and most level parts of the earth, when penetrated to any great depth, exhibit nothing but horizontal strata, composed of curious substances, and containing almost all of them innumerable marine productions. Similar strata, with the same kind of productions, compose the hills even to a great height. Sometimes the shells are so numerous as to constitute the entire body of the stratum. They are almost every where in such a perfect state of preservation, that even the smallest of them retain their most delicate parts, their sharpest ridges, and their finest and tenderest processes. They are found in elevations far above the level of every part of the ocean, and in places to which the sea could not be conveyed by any existing cause. They are not only enclosed in loose sand, but are often incrustated and penetrated on all sides by the hardest stones. Every part of the earth, every hemisphere, every continent, every island of any size, exhibits the same phenomena. We are there-

fore forcibly led to believe, not only that the sea has at one period or another covered all our plains, but that it must have remained there a long time, and in a state of tranquility; which circumstance was necessary for the formation of deposits so extensive, so thick, in part so solid, and containing *exuvia* so perfectly preserved.

The time is past for ignorance to assert that these remains of organized bodies are mere *lusus naturæ*; productions, generated in the womb of the earth by its own created powers. A nice and scrupulous comparison of their forms, of their contexture, and frequently even of their composition, cannot detect the slightest difference between these shells and the shells which still inhabit the sea. They have therefore once lived in the sea, and been deposited by it, the sea must consequently have rested in the places where the depositions have taken place. Hence it is evident that the basin or reservoir, containing the sea, has undergone some change at least, either in extent or in situation or in both. Such is the result of the very first search and of the most superficial observation.

The traces of revolutions become still more apparent and decisive when we ascend a little higher, and approach nearer to the foot of the

great chain of mountains. There are still found many beds of shells, some of these are even larger and more solid; the shells are quite as numerous and as entirely preserved, but they are not of the same species with those which were found in less elevated regions. The strata which contain them are less horizontal. They have various degrees of inclination, and, are sometimes situated vertically. While in the plains and low hills it was necessary to dig deep in order to detect the succession of the strata, here we perceive them by means of the vallies which time or violence has produced, and which disclose their edges to the eye of the observer. At the bottom of these declivities, huge masses of their *debris* are collected, and form round hills, the height of which is augmented by the operation of every thaw and every storm.

These inclined, or vertical strata, which form the ridges of the secondary mountains, do not rest on the horizontal strata of the hills which are situated at their base and serve as their first steps, but on the contrary are situated underneath them. The latter are placed on the declivity of the former. When we dig through the horizontal strata, in the neighbourhood of the inclined strata, the inclined strata are invariably found below. Nay, sometimes when

the inclined strata are not too much elevated their summit is surmounted by horizontal strata. The inclined strata are therefore more ancient than the horizontal strata. And as they must necessarily have been formed in a horizontal position they have been subsequently shifted into their inclined or vertical position, and that too before the horizontal strata were placed above them.

Thus the sea, previous to the formation of the horizontal strata, had formed others, which by some means have been broken, lifted up, and overturned in a thousand different ways. There had therefore been also at least one change in the basin of that sea which preceded ours, it had also experienced at least one revolution; and as several of these inclined strata which it had formed first, are elevated above the level of the horizontal strata which have succeeded and which surrounds them, this revolution, while it gave them the present inclination, had also caused them to project above the level of the sea, so as to form islands, or at least rocks and inequalities, and this must have happened, whether one of their ridges was lifted above the water, or the depression of the opposite edge caused the water to subside. This is the second result, not less obvious, nor less clearly demonstrated than the first, to

every one who will take the trouble of studying carefully the remains by which it is illustrated and proved.

PROOFS THAT THESE REVOLUTIONS HAVE
BEEN SUDDEN.

These repeated irruptions and retreats of the sea have neither been slow nor gradual; most of the catastrophes which have occasioned them have been sudden; and this is easily proved, especially with regard to last of them, the traces of which are most conspicuous. In the northern regions it has left the carcasses of some large quadrupeds, which the ice had arrested, and which are preserved to this day with their skin, their hair, and their flesh. If they had not been frozen as soon as killed, they must quickly have been decomposed by putrefaction. But this eternal frost could not have taken possession of the regions which these animals inhabited, except by the same cause which destroyed them;* this cause

*The two most remarkable phenomena of this kind, and which must forever banish all idea of a slow and gradual revolution, are the rhinoceros discovered in 1771, in the banks of *Vilhoui*, and the elephant recently found by Mr. Adams near the mouth of the *Lena*. This last retained its flesh and skin, on which were hair of two kinds; one short, fine, and crisped, resembling wool, and the other like long bristles. The flesh was still in such high preservation, that it was eaten by dogs.—*Cuvier, p. 37, note.*

therefore must have been as sudden as its effect.

The breaking to pieces and overturning the strata, which happened in former catastrophes, show plainly enough that they were sudden and violent like the last; and the heaps of *debris* and rounded pebbles which are found in various places among the solid strata, demonstrate the vast force of the motions excited in the mass of waters by these overturnings.— Life has therefore been often disturbed on this earth by terrible events. Calamities which at their commencement moved and overturned to a great depth the entire outer crust of the globe, but which, since these first commotions, have uniformly acted at less depth, and less generally. Numberless living beings have been the victims of the catastrophes; some have been destroyed by sudden inundations; others “have been laid dry in consequence of the bottom of the seas being instantaneously elevated. Their races even have become extinct, and have left no memorial of them except some small fragments, which the naturalists can scarcely recognize.”

Such is the opinion of the illustrious CUVIER, and thus far, had he been labouring to prove and establish the theory we have adopted, he could not have laboured more

conclusively to the point; and we shall attempt, from the premises we have chosen, to show the causes of the revolutions and catastrophes which he has so distinctly proved to have taken place.

PROOF I.

The Position of the various Strata of Rocks, Shells, and Alluvion.

That the theory we have adopted is correct, we will first attempt to prove from the position of the strata of rocks, &c. which appear on or near the surface of the earth.

The rocks composing the base, the sides, and even the summits of mountains, clearly testify in favour of our theory.

Such a similarity exists in the positions of rocks in all countries which have been explored, that we cannot doubt but they were all elevated by the same or similar causes, if not at the same time.

On plains the strata are horizontal. In many low plains the strata have never been raised, but remain as they were formed in the bottom of the ocean. When, by the revolutions, the waters receded, as will be hereafter explained, what once was the foundations of the deep was left dry.

These strata have been covered by the *debris* from the mountains, and by the alluvion which has been brought upon them by currents and inundations. The bases of more elevated plains, were raised from the deep by the heat which operated equally on the various parts, that they were raised perpendicularly.

The summits of mountains are the places under which the greatest force was exerted, and these are the places where the fire burst forth to light; hence they were elevated to a greater height.

The strata composing the sides of the mountains, are inclined to a plane of the horizon in various degrees, in proportion to the height of the mountains, and the steepness of the precipice which they compose. Some of the strata are perpendicular, while others are nearly horizontal, and the strata are found, in all degrees of inclination, between these two points.

If we suppose a force to be exerted beneath a horizontal plain, the whole plain is raised, but the force concentrating into certain points, elevates them more than in others, it is easy to conceive that the strata would be inclined in proportion to the height to which the point was elevated. This is the situation of the po-

sition of the strata composing the sides of mountains.

These strata near the base of the mountains, dip beneath the horizontal strata of the plain, which proves, as CUVIER observes, that the inclined strata are of more ancient formation than those of the plains. The strata of the plains, or those which cover the inclined ones, were formed after the mountains were raised, by currents which flowed to the sides and even summits of most of the mountains.

Beneath the strata of secondary rocks, the primitive are deposited. These were formed, as has been stated, by the matter becoming liquefied by the heat which raised the land, and when the heat subsided, they consolidated into extensive masses, and in general retained the position in which they were formed beneath the secondary ones.* But these *primitive*

* The greater the degree of heat is to which matter is exposed, when it becomes liquefied, the harder or more dense the body is when it becomes a solid, and more heat is required to reduce a solid to a fluid the second than the first time. Hence lead, iron, &c. by frequent melting, become harder. Hence, the lower strata of primitive rocks being exposed to greater heat when the matter composing them was liquefied, are found to be harder.

In Ohio, and the other western states, in boring wells for salt water, the miners judge of their distance from the bottom of the rock, beneath which salt water is found by the density of the rock. Near the bottom, the rock is so hard that their implements have scarcely any effect upon it. Here the rocks were not elevated by so sudden a force as to break or remove them from the position in which they were formed, and the lowest having experienced the greatest degree of heat, is found to be the most dense.

rocks are found to crown the summits of mountains, more particularly those of the highest class. When the strata which were formed horizontally in the bed of the sea were elevated, they could not cover a greater surface than they had covered when they were formed; hence they could not cover the sides and summits of mountains. They must have been separated, and in the places where most force was exerted, the divisions would be made. Beneath the summits of mountains the forces concentrated; here the rents were made, and here the matter composing the primitive rocks was elevated to the greatest height.

In some few places the strata of *secondary* rocks have been discovered below the masses of *primitive* ones. In those places, the force which elevated them was so great, that the strata, when elevated, were inverted.

In many instances, masses of primitive rocks have, by earthquakes, by frosts, tempests, &c. been loosened from their seats on the summits of mountains, and have been precipitated down the precipices, and at last rest on strata of *secondary* ones. In other instances, immense masses of *primitive* rocks have been borne in ice and currents, far from the situations in which they were first deposited. It is rational to conclude, that in such explosions as those

which elevated mountains and continents, vast fragments of mountains would be projected to a great distance, and when they descended, they must have rested on strata of *secondary* rocks. Hence we have a cause for the appearance of many clefts, and eminences of rocks, reposing on plains far distant from mountains and of congenial strata.* If in such explosions as are witnessed in *Ætna*, rocks of hundreds of pounds in weight are thrown miles into the country, what might we not expect from an eruption which raised the *Andes*, *Cordilleries*, the *Alleghany* and *Stony mountains*?

PROOF II.

The formation of the various Strata.

The strata of *secondary* rocks are of different thickness.

Parallel interstices separate one stratum from another, which evidently shows that they were interrupted in their formation, or that petrification was from some cause prevented, and

* From the appearances of precipices, or fragments of mountains on plains far remote from ranges of mountains, and from the situation of many small islands and rocks near the coasts of continents, and of larger islands, the ancient poets, doubtlessly, derived the idea of times when gods contended in mortal strife, and mountains were the weapons of warfare.

when it again commenced, the new stratum did not adhere to the preceding. The upper strata in general are thinner than the lower, or they increase in thickness as we descend. The last formed strata are composed of coarser particles, and have more sand blended with them than those of more ancient formation.

As we descend to considerable depth into a quarry, we find the marble better, and in masses much thicker than towards the surface.

On the Eastern continent, the strata of secondary rocks are not only finer, but exist in much thicker layers than any that have been discovered in the *new world*, and they are not covered by so many thin strata as they are in America.

The solid masses of marble of great thickness, from which the magnificent monuments of antiquity were fashioned, were formed in the bed of the ocean before any *dry land was caused to appear*. Then the waters were not agitated to interrupt the regular process of nature. Then there were no debris, and sands from mountains, conveyed to the ocean and deposited in the strata. Hence, the marble formed previous to the waters being gathered together, is finer, and exists in more extensive masses. But when from the land's arising, currents were formed, and earthquakes commenced, pe-

trifaction was interrupted, and when the waters from any cause were agitated to the bottom, there terminated the thickness of the then forming stratum. When a calm again commenced, then commenced a new stratum. As more lands arose, more violent were the tempests, more forcible the currents, more frequent the earthquakes, more sand and debris were conveyed to the oceans; and thinner and of coarser materials are the strata which were formed.*

The force which elevated these strata was so violent, that in many places, especially in mountains, where its strength was most exerted, they were broken, and it is not uncommon to find them in a perpendicular direction from what they were formed, and even in an inverted position. On opposite sides of mountains the strata are inclined in different directions. On the west of ranges of mountains the lower

* In none of the quarries which have been opened in America, have been found such sound and solid strata of marble, as have been taken from the quarries of Upper Egypt; but we have no reason to doubt, if our quarries were wrought to a sufficient depth, but that as fine stone could be found, as adorn the temples of the old world. Before we can arrive to marble of the same quality as theirs, we must break through or remove the strata which were formed in our section of the world, after the Eastern continent was raised from the deep, before our part of the world was summoned to appear. Many quarries, which have been partially explored, may contain some of the marble which was formed previous to dry land's appearing; but such are in situations in which they were so much exposed to the convulsions which raised them, that the blocks are generally in a broken state.

edges of the strata dip to the west, while on the east they uniformly dip to the east, which shows that the force which caused them to rise, broke forth in the summits of the mountains.

PROOF III.

The various Colours of Marble.

The various colours and shades of marble coincide with our views of this subject. The clouded clearly indicate a small degree of motion in the water, while the matter composing the strata existed in a paste like substance, not easily broken, but capable of being agitated by a small motion of the incumbent fluid. The white marble was formed in situations to which none but similar particles were conveyed. Those quarries from which marble is taken variegated with various colours, had their formation in situations where the shells of various kinds of fishes, in different degrees of decay were collected. The entirely black marble received its existence in positions similar to the white, but where particles in a different state of preservation, or degrees of decay, were collected and deposited. - Frequently in blocks of marble, which are generally white, are found places of considerable extent of a different colour. These spots are composed of *exuviae*,

which united in the water in the form of a scum, floated or were driven by gentle breezes on the surface, till mixing with other particles, they became of greater density than the waters settled to the bottom of the ocean, rested on a stratum of marble which had not often been visited by such guests, adhered to its surface, were soon covered by succeeding particles of the same colour as the rocks on which they reposed, and there rested till the genius and industry of man have brought them to view.*

PROOF IV.

Veins of primitive Rocks perforating the strata of secondary ones.

In almost every stratum of *secondary* rocks in our country, and doubtless in every part of the world, are to be found veins of primitive rocks, running and branching like veins in various directions. In all respects they resemble in their courses and windings such as would be formed by melted metal diffused through long

* The marble of America contains more such spots than that of the eastern continent. Many light particles washed from the lands in the old world, collected on the ocean, were carried by the regular tides from the shores, and driven by the unvarying winds which then prevailed, to where America was destined to appear; there the current subsiding, they settled, and remained till elevated in rocks to form the basis of our plains and mountains.

interstices. Some of these veins are of vast extent and thickness.

By the theory we have embraced, the cause of these phenomena is easily illustrated.

When the fire beneath the many strata of *secondary* rocks imbedded at the bottom of the deep, raged to such a degree as to liquefy the matter near the incumbent strata, but had not acquired force to raise the firm foundations of the oceans, innumerable rents were made in the secondary strata; and the matter which had been converted to a fluid in the vast furnace of nature was forced upwards, and in every direction where rents or interstices had been made. These veins when at such a distance from the flaming gulf as to lose their heat, consolidated into matter more dense than the rocks through which they had flowed. When the fire had acquired sufficient force to elevate its massive covering, all was raised together, and these veins, not only in broken and cragged cliffs, but in the smooth and polished marble, and even in the stones in the streets, bear testimony of the correctness of our theory.*

* No clearer illustration of the formation of variegated marble and interstices, can be given, than is to be seen in the pillars of the Capitol at Washington. The stone is composed almost wholly of pebbles of every colour, size, and shape, except square, cemented by matter as hard as themselves. In various places, veins of white

PROOF V.

The Mines of Salt.

The mines of salt, which are found in various countries, are proofs of the correctness of our theory.

While the fire was raging beneath the bed of the ocean, and had not acquired strength to spring to light, as openings were made in the barrier which divided the raging element beneath from the briny flood above, the waters

primitive stone run through the pillars, entirely separating the pebbles, or breaking some and separating others.

The formation of the pillars of the Capitol leads to the following conclusions.

1. Every pebble of which they are composed being rounded, renders it evident, that all of them were rolled a great distance by a current, before they rested in the place where they were cemented.

2. They must have been cemented into a solid mass, before the interstices of *primitive*, which appear in them, found places there, for if they had not been firmly united, some of them would not have been broken in the centre, rather than separate one from another.

3. Great force must have been employed to rend in various directions a solid stratum, so dense as that small pebbles would split before the matter uniting them would give way.

4. The matter which filled the interstices or rents that were made through the stratum, must have been in a liquid state when it entered and filled those rents; for they turn in so many directions, and wind in so minute channels and veins, that no solid matter could have been diffused so far.

From these conclusions we infer, that the pebbles composing the marble of the pillars of the Capitol were deposited where they cemented, before America was raised from the ocean; that the force which raised them, broke the stratum in various directions, and that the matter

flowed into the burning caverns, the aqueous particles were dissipated in vapours, and the saline only remained to close the fissures, and bar the flames from light.

When the bottom of the deep arose, the masses of salt which had been formed and confined, as has been stated, were elevated with the strata, and many of which have been explored for the benefit of man.

which was liquefied by heat beneath, was forced into the interstices, and appears in the white veins which so beautifully variegated the whole mass.

When the first lands which we have supposed to be the eastern continent arose, innumerable fragments of rocks must have covered the surface. These, like other materials, were by tempests and streams rolled to the ocean. The currents of the ocean as has been stated, and will be explained, moved to the east and west from the land. The bottom of the ocean when it remained unbroken, was a solid rock. These stones by a regular current would be rolled to a great distance; and were the bounds of the eastern continent no more extensive than they now are, it is not inconsistent to suppose, that the pebbles which form the firm and elegant pillars of the Capitol of FREE AMERICA, were driven by the laws of nature from realms long shrouded in the gloomy clouds of despotism.

The pillars forming the Giant Cause-way, in Ireland, which have excited so much attention, were formed in the same manner as the veins of primitive rocks in those of the secondary class, with this exception. The veins in rocks were formed by liquid matter being pressed between solids; but when the fire beneath the bed of the ocean, before it raised its incumbent load, made rents through the strata, and masses of liquid matter from beneath were propelled into the ocean above, they suddenly cooling, formed those regular columns which have so much astonished the world. Matter in a solid state does not occupy so large a space as when in a fluid. When the matter composing the pillars of the Giant Cause-way was cooled in the water, it must have contracted, and this contraction produced the numerous interstices which formed into regular pillars the vast torrent which was propelled from the raging furnace of nature.

Springs and rills filtrating through these veins break out into the vales impregnated with the useful mineral.*

PROOF VI.

The Caverns in the Earth.

The many and vast cavities in the earth are ready witnesses in our favour.

When the mountains arose, vast spaces were formed between the fragments of the strata.

* On reflection it will not appear inconsistent to suppose that in some places where rents were made in the bottom of the ocean, the waters would flow into them, while in others the liquid matter from beneath would be propelled into the ocean. If a direct rent was made from the fire beneath to the water above, extending as low, as to the liquefied matter, the raging ocean beneath would be urged to rise with such a violence, that the one above could not descend, as was the case in the Giant Cause-way, and in several other places where similar pillars have been found.

But if a rent or fissure was made in an irregular direction from the flaming mass beneath to the waters of the ocean, the fluid below would not press upwards with such force as to prevent the waters from descending. Into such interstices the waters rushed to form the salt mines which are found in almost every section of the globe.

If such rents were made, and the waters flowed in, the force of the heat would be diminished; that when the fire had acquired strength to burst to light, and raise all above it, in such places less power would be exerted, and to a less height would the lands be raised.

No salt mines have ever been discovered on elevated grounds, but uniformly in depressions of the original strata. In many places alluvial formations may rise into eminences on these mines, but they have never been discovered but in depressions of that part of the earth which was first raised.

We believe that there is one extensive range of salt running through

Such as are above the level of the ocean, or have no communication with it, still remain vacant unless filled with alluvion.*

PROOF VII.

Of Lands which have sunk.

Islands and parts of continents which have sunk in various periods of the world, clearly prove that there are immense caverns beneath the continents and islands.

When the dry land appeared, mountains, islands, &c. were supported by the arches formed by broken strata, resting on the sides of the abyss from whence they arose. If these arches are not sufficiently firm to resist the hand of time, or the shocks of earthquakes, their incumbent burdens press them to the dreary caverns from whence they emerge.

It is not uncommon for large extents of high country to sink during an earthquake, and many cities in such convulsions have sunk to be

the United States, from north-east to south-west, commencing near Lake Ontario, and that there are many collateral branches extending from this.

* In every country which has been explored, many caves have been discovered, some extending several miles in various directions, all manifesting that they were formed by vast convulsions of nature. That there are many which are below the surface of the ocean and filled with water, we will attempt to show, when we treat of the tides.

seen no more.* These catastrophes could not have taken place were there not vast cavities below the surface of the earth. During an earthquake, large caverns have opened from which waters have rushed in torrents, which proves that many of these caverns are filled by the ocean.

PROOF VIII.

The many Islands which have arisen from the ocean.

Since events have been recorded, many islands have been known to arise from the seas and oceans. These have been raised by fire, which after continuing to rage, and emit smoke and vapour for various periods, has been extinguished. Some of these islands have disappeared, others remain apparently firm to the present time.

If islands have been raised in this manner why should it appear incredible, that greater

* No low lands, nor cities which are situated on plains of small elevation, have ever been swallowed up by an earthquake. Low plains, as has been observed, rest not on arches, or broken fragments of rocks, but on the foundation which was formed in the bed of the ocean, and has been left dry by the subsidence of the waters; and then enriched by alluvial deposits from the mountains.

Some pretend that the density of the earth is constantly increasing as we descend from its surface. Of such theorists we would inquire, where cities, plains, and mountains, have retired to, when during an earthquake they have sunk from our view?

fire at greater depths should have existed, and acquiring greater force should raise masses equal to the most extensive mountains, and even continents? Mountains have been elevated from plains, and have withstood, for centuries, the ravages of time and the convulsions of nature, and why may not continents be raised and supported in the same manner?

When the continents were projected from the deep, and the force of the heat had subsided, those parts which were not firmly supported, sunk again to the caverns from whence they were raised. The only traces which now remain of them are seas and gulfs, and the islands whose surfaces are but just above the waters. If they had been firmly supported they would have intercepted the course of the clouds.*

* We are convinced that the West India islands were parts of the range of mountains which united the Andes to the Alleghany mountains.

When the fire which raised our continent subsided, that portion of the range of mountains which extended on the east of the Carribbean sea and the Gulf of Mexico, and reached as far to the north, as where now the Alleghany mountains terminate in the state of Mississippi, had not so firm a foundation as it had to the south and north, and sunk in a great degree into the abyss from which it was projected. When the agitation of the waters ceased, and the ocean subsided, many parts of the range remained above the surface of the seas, and now appear in the group of islands between North and South America. The basis of East Florida is a part of the fallen mountain. The summits of this range are now covered with an alluvion, which will be hereafter explained, and which gives great fertility to the lands.

PROOF IX.

Of Earthquakes.

Earthquakes speak loudly in favour of our theory. The air which fills the vast cavities, formed by broken rocks, above the surface of the waters, becomes so rarefied that it must have vent. As it expands, and striving for liberty, causes islands, mountains, and even continents, to tremble to their centre, and when it bursts its bounds, "desolation marks its progress," and whole cities and provinces are swallowed in the yawning gulfs which it opens in its progress. Promontories, capes, and islands, which are pendent over the abyss from which they were raised, and are supported only by being united with strata resting on a firm foundation, are by the shocks of nature severed from the parts which have for ages upheld them, and they sink to appear no more.*

* Pliny describes an earthquake which swallowed up thirteen cities in Asia Minor, in one night. The many accounts which we have of earthquakes, both in ancient and modern times, clearly evince that there are vast cavities in the earth in innumerable places, even under the foundations of the ocean. Some most eligible sites for cities have been entirely abandoned, on account of their being so subject to earthquakes. These were situated near some cavities which were formed when the lands appeared. Earthquakes are not so frequent nor violent as in ancient days. By the depression of lands, cavities have been

PROOF X.

Volcanoes.

Volcanoes prove the irresistible force of fire when long confined in caverns, and that there is combustion in the solid parts of our globe, to feed and support this devouring element. Volcanoes, or such as exist at the present time, have their origin near the surface of the earth, compared to those which caused the continents to rise. The present exist but in the mass which was raised by former ones, or in the combustion which was collected and buried during the general deluge.*

lessened; and by the rarefaction of the air in these caverns much has been expelled which produced former convulsions, that now subterranean pressure is not so great.

* It may not be improper to notice here the objections which have been made to the theory of *primitive* rocks being volcanic productions. The principal ground of objection is, "Primitive rocks have no resemblance to lava which is wholly volcanic." Neither have brick, earthen, or glass, a resemblance of lava, yet it cannot be denied, but their present solid state is produced by heat. In decomposing particles of matter by heat, and suffering them to consolidate, much depends as to their appearance on the situation of the matter when fusion commences, and on the manner of its cooling.

Lava is thrown in a state of fluidity into the atmosphere or water, and by the sudden transition from heat to cold, is left light and porous. But the *primitive* rocks consolidated in a very different state. They were mostly covered by strata of secondary rocks which secured them in a great degree from the influence of water and air. They must have been a long time in becoming cool. They existed in such masses that merely by pressure, when in a fluid state, they would be rendered compact. The lava by being exposed to the air, when in fusion, throws off many particles which are retained by the *primitive* rocks.

PROOF XI.

Of Mountains.

The situation of mountains clearly indicates, that they were formed in the manner we have described. They generally exist in ranges of vast extent, with others, of less magnitude, extending from them in various angles. The branches of the principal ranges diminish in height as they extend from the main ridge.— This, we readily perceive, would be their situation, if they were elevated by fire from beneath. Where the principal rent was made, the force of the fire would concentrate, and

The surface of those *primitive* rocks, which appear on the summits of mountains, and were exposed to the influence of the atmosphere, may have been porous like lava; but the constant operations of frosts and tempests, for revolving centuries would have smoothed the rougher parts, and even loosened and washed away many particles from the solid mass.

The various densities and colours of primitive rocks were occasioned by the position of the matter composing them, relative to the heat which reduced it to solids. Some rocks were so remote from the furnace that the sands and flinty particles were not liquefied, but became so infused with the ascending vapours, that they adhered in solid masses. While others were heated to such a degree that all the particles were reduced to the same compact substance. We will venture to hazard the conjecture, that the subterranean walls which have been discovered in the state of Georgia, and which have excited great wonder, and speculation among the curious, were formed by the liquid matter which flowed from the masses of primitive rocks, before they had time to cool and become solid. That the stones composing these walls are *Basaltic* many are ready to admit. They are of the same materials as the pillars in the Giant's Cause-way, and many others in various parts of Europe. Those of Europe were formed by the liquefied

elevate the edges of the crater to the greatest height. Lateral branches would project from this in different directions.

In some general ranges, are found depressions, plains, or vallies, of great extent. In such places, the rocks and fragments beneath did not afford sufficient foundation to support such a cumbrous burden; and part of the range settled in the abyss from whence it came to light. Such depressions were at first covered with waters, forming bays or lakes, which in process of ages were filled with *debris* from the mountains, or by alluvion, brought to them by torrents and subsequent floods. In almost every country are some mountains, which rise in forms of pyramids unconnected with any range. Some of these have arisen in the manner of one in Mexico in the last century, and have assumed their present regular forms, by storms washing the *debris* from their summits and sides, and leaving deposits near their base.

matter being raised perpendicularly, and contracting as it suddenly cooled, left interstices between the columns. But the flaming mass which flowed from the mountains, and formed the mysterious walls, flowed in a horizontal direction; and instead of bursting from the flaming abyss into the water, forced its way through the alluvial deposits. As the particles contracted in cooling, chinks and interstices were formed, similar to those in the cause ways in Europe, except running in horizontal directions. These interstices in a succession of ages have been filled by various mineral deposits, brought by streams from the alluvion, that have corroded in a degree the surface of the stones, and given them the appearance of cement.

Others have assumed their present form by the sinking of the lands around them, while they alone rested on foundations which could not be shaken. But many of the solitary cliffs, and even some distinguished by the appellations of mountains, are but fragments of general ranges, projected to their present station by that vast explosion, which must have convulsed the earth to its centre.

PROOF XII.

Of the masses of Shells deposited on the sides of Mountains.

We introduce the masses of shells, which have been discovered on the sides of mountains in almost every country, as proofs in favour of our theory.

That the deposits of shells on our plains, and on many of the mountains, were made by currents and floods, we will attempt to show in treating of alluvial deposits; but many that are situated high on our mountains, must be accounted for in a different manner.

They were reposing on the bottom of the ocean, not having experienced a sufficient degree of decay to cement into rocks, when the firm foundations of the deep were broken up, and were raised from their native element,

with the bed on which they reposed, and remain as lasting monuments of the dreadful convulsions which our planet has experienced.*

PROOF XIII.

Of the Ocean receding from the Lands.

It is evident, that at some remote period of the world, the ocean has receded from the land, leaving dry great extents of country, over which for ages the waves unmolested rolled. Of such are the extensive table lands in Siberia, in the south west part of the United States, and in various other parts of the world.

That there have been as many as three such declensions of the ocean, appears from the number of these horizontal plains, rising one above another as we depart from the ocean. The ascent from one to another is abrupt, which shows that the subsidence of the waters was sudden. Marks of the waves on rocks far above the rise of the ocean at the present time, as clearly indicate the retiring of the

* From the perfect state of many of these shells, we cannot doubt but they were enjoying life at the time when they were transported to the places they now occupy. It is probable they were not in such vast heaps in the bottom of the ocean as they now are. But those which were elevated nearer the summits of the mountains, were washed down by the retiring waves or subsequent tempests, to the places in which they now are found.

waters. Since records have been kept, we have no proofs of the waters receding from their former bounds.

In harbours, the waters have maintained their height for many centuries. As they have not diminished for more than twenty centuries, we must conclude that the cause of their diminution has ceased to operate.

When lands were raised, as has been stated, the waters flowed in to fill the cavities from whence they were raised; hence a depression in the ocean would be equal to the quantity of matter raised from beneath, and remained above the surface of the waters. When the lands arose, the waters would be propelled to and cover the adjacent shores, and when the repelling cause no longer existed, the waters would retire from the lands on which they had been driven, and leave exposed to the air much that had been enclosed in their bosom.

If we estimate the matter in America, which is above the level of the ocean, at five millions of cubic miles, and the whole surface of the ocean at one hundred and sixty millions of square miles, when our continent was raised, five millions of cubic miles of water were received into the cavities which were left vacant by the ascension of America. By this supposition, the waters in the ocean would subside one hundred

and sixty-five perpendicular feet, leaving lands dry on the eastern continent which had previously been covered to that depth. But the whole of America was not elevated at the same time, therefore so great a subsidence in the waters has not taken place at any one time. But when lands have been projected from the deep, when the agitation has subsided, the waters have receded from the shores, which accounts for the diminution of the waters at various periods. Whenever a large extent of land has been raised, the ocean has declined in proportion to the matter elevated, and when islands or parts of continents have sunk, the ocean has been raised in the same proportion.

PROOF XIV.

Alluvial Formations.

The alluvial formations, and the various species of relics which they contain, afford abundant proofs, that the revolutions and catastrophes which our world has experienced, were the effects of the causes we have described.

From facts recorded by many able and ingenious writers, we cannot doubt but the continents have several times been partially, and once totally covered by waters, and that the

currents which covered them were violent, and flowed in different directions.

The alluvial deposits on the eastern continent, clearly show that the waters which drowned the old world, flowed from the south-west to the north-east; and Dr. H. H. Hayden, in his excellent geological publication has as clearly shown, that the currents which formed most of our alluvial soils, flowed from the north-east to the south-west.

That the waters which drowned the world, should flow in opposite directions, may appear inconsistent at the first view of the subject, but on an impartial examination, there will be no room for doubt.

We will first attempt to explain more fully the cause of the universal deluge, show the courses which the waters would naturally flow from such a cause, and the effects which they would have on the surface of the earth; then we will endeavour to explain the causes of the subsequent floods, which partially inundated the world.

The universal deluge, as has been stated, was caused by the rising of America from the ocean.

At this important crisis, when the foundations of the ocean were raised, and when, as the inspired historian has most elegantly ex-

pressed it, *The fountains of the great deep were broken up*, the waters must have retired in great agitation to the east and west, from the sides of the rising continent.

The length of America being nearly from north to south, from the eastern side, the waters would be rolled to Europe and Africa, and from the western side, they would be driven to Asia. South America extending farther to the east than North America, would give the current which was to overspread the eastern continent, a direction to the north of east.— This current bore with violence the shells and fishes of the ocean, to the plains and mountains of Europe, and the vegetables of Europe and Africa, to the eastern parts of Asia. There the current was met by that which flowed to the west from the western coast of America.— There each current was stopped in its destructive career by opposing each other; and there immense deposits were made, as will be hereafter explained.

When *the fountains of the great deep were broken up*, and the ocean above rushed in contact with the flaming ocean beneath, the evaporation must have been immense.

The winds, before this, as we shall show, moved unmolested from east to west, round the globe. Then on a sudden they were ob-

structed by the towering burning mountains. They rolled back, as if astonished at the new phenomenon, laden with the vapours of a boiling ocean. Violent must have been the conflict between the hot subterranean and the cool ethereal particles. The clouds, in their sublime evolutions, moved in the direction of the waters, to the east and west from America.

They met in awful array over the old world. There they discharged their burdens. There the vapours condensed; and no language could be more expressive of the dreadful torrents that then descended, than that which was dictated from above, and which declares, that the WINDOWS OF HEAVEN WERE OPENED. Forty days were these vapours descending.—*And the waters prevailed exceedingly upon the earth, and all the high hills that were under the whole heavens were covered.* And the rain ceased. But an hundred and fifty times did the earth revolve in her cumbrous mantle, before the waters retired to the caverns from whence our continent arose.

And God made a wind to pass over the earth, and the waters assuaged.

Here the Almighty made use of natural means to assuage the waters, and the means are perfectly consistent to reason, and agree

with the positions we have taken. The winds blew in a direction opposite to the courses in which the waves and clouds had moved, when sent with overwhelming ruin to that guilty land. While the waves and clouds were executing their commission, the atmosphere there became cold, damp and dense. While here, the air was in a great degree rarefied by heat from the flaming abyss within, and from the burning mountains without. It is as natural for the colder atmosphere to flow to warmer regions, as for water to descend an inclined plane. The current of air towards this continent hastened the return of the waters.

Let us pause for a moment, and reflect on the situation of this new born continent, and the state of the waters, when they returned from completing the works of divine justice on a guilty world. There they were accumulated upwards of four miles in height, to cover the highest mountains in Asia. Here were cavities of equal extent with our continent, and of a depth, equal to the height of our mountains, burning, and literally thirsting for the returning waves. The waters rolled back as in triumph, accelerated by the pressing winds, and loaded with the spoils of a conquered world. The huge frame of the elephant, the mammoth, and the numerous species of animals

which had revelled on the plains of the eastern hemisphere, borne on the same surges with wretched fallen man, for whose sake all nature mourned, together with the carcasses of the monsters of the deep, were brought as trophies of victory to fertilize our shores. The vegetables and seeds of Europe, Asia, and Africa, were brought to adorn our youthful world.— When the conquering and conquered hosts returned, imagination fails in attempting to form a picture of the skeleton of this now blooming land.

From the southern extremity of South America, as far to the north as the Alleghany and Stony mountains extend, were naked burning rocks, in some places towering above the clouds, resting on fragments of broken rocks pendent over caverns deeper than mortal eye could fathom. In some places, the foundations of mountains sinking beneath cumbrous loads, which plunge to lasting oblivion in the gloomy abyss which is open to receive them. Thus sunk the extensive range, whose highest summits now are seen in the clusters of islands, between the Americas. The waves returning in mountainous heights, were borne far over the lands, and dashed against the sides of the lofty mountains. The steam issuing from the caverns, and the rocks supporting the conti-

ment, prevented the waters from sinking suddenly into the veins and cavities of the earth; but in surge after surge they rolled over our plains. The fleshy parts of the numerous species of animals which were brought from the old world, were dissolved, or torn from the solids which were scattered along our shores, and even over our highest plains. The muscular parts of the larger species, as the mammoth, whale, &c. longer bound the bones together, that in some places the bones of such animals have been found nearly entire.— The smaller species, and even some of those whose magnitude almost exceeds the bounds of human conception, were broken against the naked cliffs, and, in detached pieces, were deposited in innumerable places in the new world. Hence we have the cause of the individual bones of the elephant, and of the numerous species which inhabited the old world, mingled with those of the monsters of the deep, being found along our shores, and buried beneath our alluvion, many hundred miles from the present bounds of the ocean.

PROOF XV.

Of the Alluvial Deposits made by the General Deluge.

There is no criterion by which we can better judge of the direction in which the currents flowed, than by the alluvial deposits which they made. In tracing the courses of the currents, by which the alluvial formations were made, it is necessary, first, to observe in what situations deposits would be made by violent currents.

1st. If a current flows directly against a mountain, and is not of sufficient height to pass the summit, the alluvion will be placed at the base of the mountain on the side opposed to the current.

2d. If the current is of sufficient depth to pass over the hill or mountain, the alluvion will be deposited at the base and on the sides of the hills or mountains, opposite to those which were presented to the current.

3d. If a current flows obliquely against a mountain, and passes by, and the land is overflowed on the opposite side, there will be a calm, and the alluvion will be deposited there.

4th. If two currents meet from opposite directions, of equal force, the deposits will be made at and near the point of contact.

5th. If two currents meet in oblique directions, the alluvion will be deposited in an angular point, half way between the two currents, had they passed uninterrupted.

With these propositions, which are easily demonstrated by the laws of motion, the various alluvial deposits can be accounted for, if the currents flowed in the directions we have stated.

1st. The currents that overflowed Europe and Africa, came from the south-west, as has been stated, and was of sufficient depth to overtop the mountains.. Hence, the western coasts of those quarters of the world, were stripped of their coverings, left naked and bold, while the alluvia were deposited on the east and north-east of the mountains.— This is the state of these countries. The current moved with such force and velocity, that rocks were torn from the mountains, and left in countries remote from their native strata. Hence, the rocks from the Alps and other mountains are found embedded in the alluvia many hundred miles distant. The current had force to burst through the solid earth, and excavate vast seas and gulphs. Hence, England was severed from France, and Ireland from Scotland and England, as the rocks and clefts on either side bear incontrovertible

testimony that they were once united. When the current rushed over the Norwegian Alps, it excavated the bed of the Baltic sea; when it passed the Alpines, it formed the gulf of Venice; from the high lands in England and Scotland it rushed, and bore away the soil which filled the space now occupied by the North sea; from the summits of the Carpathian mountains it rolled, and formed the basins for the Black and Azof seas; from the Lybian mountains, the channel of the Red sea was formed. In rushing from the summits of Taurus and Caucasus, the Caspian sea was formed. From the mountains of the moon it flowed to excavate the sea of Arabia. It rolled over the Gaut mountains, and made the bed for the sea of Bengal. Many tracts of land, now islands, were torn from the main land by the same irresistible current. Madagascar was rent from Caffraria, Ceylon from Hindostan, and many other seas and channels were formed at the same eventful crisis.*

* By this hypothesis we are induced to believe, that the eastern continent before the deluge was much more extensive than it now is. When the beds of the seas were excavated, they were much more extensive than they now are. This will appear when we treat more particularly of the alluvial deposits. We believe and shall attempt to prove, that the Mediterranean sea was formed by the subsidence of that part of the earth. We believe many chasms were formed by the current we have described, and that the same have since been filled by alluvia. Of such, we believe, there were a number in France, made by the waters precipitating from the Pyrenees. These were

As the currents from America flowed over Europe laden with the shells of the ocean, many of these were deposited where eddies and calms were formed by projecting mountains. Most of the vegetables of Europe were borne by the surges to the eastern parts of Asia. But whole forests were buried in Europe. In England and Ireland subterranean forests are common. These forests are prostrated to the east, or north of east, and are covered to a great depth with marine shells, and various other deposits. They are in such a situation, as the currents we have described would leave them. But such of the vegetables

filled as the waters returned, as will be explained, and by which the many strata of alluvia near Paris can be accounted for. By this theory the cause of Europe's being more cut up by seas and bays, than other parts of the world can be explained. The mountains in Europe lay more opposed to the current than those of Africa or the interior of Asia. In Asia and Africa, the principal ranges of mountains run from nearly east to west, or about in direction with the current, that the waters did not pour over them with such force, as they did over those which lay from south to north. If reliance can be placed on the reports of travellers, there is not a mountain on the eastern continent, west of those in Kamtschatka, but has a gulf or a sea on the east or north east side of it, or an extensive alluvion, bearing evident marks of their once being a cavity for a lake or sea. There are none on the west of such mountains. The sea of Ochotsk, was formed by the current which moved to the west from America, and precipitating from the mountains of Kamtschatka. The barriers over which the waters rushed to form the Yellow sea, were the mountains in China, those to form the Gulf of Siam, were in Malaya, those to form the Chinese sea, were in Cochin China. The mountains of Sumatra, made the water wear the Straits of Malacca, and separated the island from the main; those of Arabia formed the Persian gulf,

both of Europe and Africa, as were not instantly covered, were conveyed to the eastern parts of Asia, and when the two currents which encompassed the globe there met, they both were stopped, and there the greatest deposits were made. The masses of vegetable mould, several hundred feet in thickness, in China, bear witness of these deposits. And the extensive strata of coal found in alluvion in those regions, are no less substantial testimony than the former.*

As the waters returned from the eastern parts of Asia, when God caused a wind to assuage them, they moved over Europe with less velocity than they did when they destroyed every animal and every green thing. In their return, far greater deposits were made than when they advanced. The waters were

* It is believed, that the numerous strata of coal, which are found in almost every country on the globe, are formed of the vegetable productions of the antedeluvian world. These productions were collected in extensive masses by the whirling currents, were jammed and dashed in pieces by the tumultuous waves, were overwhelmed by surges loaded with shells, sand, and clay, sunk in the earth, and undergoing a degree of fermentation, were converted from wood, bark, and leaves, to their present state. Though forests have been discovered far beneath the surface of the earth, which were doubtless buried at the same time, yet remain entire. This does not prove but coal may have been formed as has been stated, and whole timber preserved its primitive properties. Where forests were swept down and covered in an instant; where separate trees were surrounded by solid earth, or *exuvie* they would be far less liable to undergo any chemical change, than if they had been bruised and beaten into one almost solid mass,

loaded with soil. Many of the caverns which were made by their former rapid motions, were lessened, or wholly filled.* Much of the animal and vegetable remains which were swept to the east, were now returned towards the west, and where the velocity of the waters was retarded, or a calm or eddy produced by opposing mountains, deposits were made. Coal mines are found in every nation of Europe. In some places the strata are horizontal, in others they have different degrees of inclination, depending solely on the situation of the surface on which they rested.

Marle and gypsum are likewise found in almost every section of the world. These likewise are the deposits of the deluge. Shells, and other animal remains, gathered by the waves in extensive masses, as were the vegetables, were broken and pulverized by the whirling eddies, settled in heaps and strata when the waters subsided, and condensed into their present state, by a similar process as formed the coal. Thus gypsum was formed.

The remains of which marle was composed, were less exposed to the dashing of currents against rocks; they were preserved in a more perfect state.

* That the basins of the Black sea, sea of Azof, and of the Caspian sea, were much larger than they now are, all travellers agree.

Strata of coal are often found mingled with gypsum, the union took place, while this matter composing them was tossed to and fro by the waves.

Strata of coal are found reposing on beds of gypsum. There the animal remains forming the gypsum had been conveyed and settled in the calm, or were swallowed in a vortex, before the vegetable mass was transported to its destined rest. Gypsum is found resting on strata of coal. Here the order of deposits was but inverted.

Some strata of lime-stone may have been formed in a similar manner. Beds of shells, by these currents, were collected and deposited, not only on plains and vallies, but even on the sides and summits of the highest mountains in the old world. Many strata of alluvion may have been formed by the currents and counter currents during the deluge.

Lakes of fresh water, which for centuries had been making deposits, were instantly filled with salt water remains. Channels of rivers were stopped up, and the cavities in the mountains were filled with the animal and vegetable remains, which the agitated waters had reduced to an undistinguished mass. The remains of man, of the lion, tiger, hyena, and the fell monsters of land and sea, found one

common grave. Thus the face of nature was completely changed, and the old world was literally destroyed. The carcasses of the animals of Africa and Europe, were transported to the north and east of Asia, while the returning current brought the animals of Asia to Europe, Africa, and America. The fishes which have been known to inhabit only the waters near the coasts of the Sandwich islands, were transported half the circumference of the globe, and even round from the east to Europe and America, where their remains are now found, to the admiration of the curious.

We will again follow the course of the returning current to America, and trace its effects over our plains, and among the mountains. Here we are to expect to find the alluvion differently located from what it was on the eastern continent. There the first deposits were made by a current which flowed above the mountains, which left its burdens, as well as excavated the earth on the sides opposite to the one which resisted its fury.* When

* It is evident that a torrent of water, when it is precipitated from a mountain as from a dam, would make large excavations in the earth, where the force of the water was exerted or opposed. When the plain or valley was filled with water as high as the summit of the mountain, and the current continued to flow in the same direction, it would no longer beat upon the earth; and that section of the water protected by the mountain would be at rest; there the soil and exuvix, which had been borne over the mountains, would settle, and there we should

the waters arrived at our continent, the mountains presented an insuperable barrier to the waves. Surge propelled surge near to the summits. Vast quantities of the animal and vegetable remains of the old world were brought to our lands. Extensive drifts of timber, the productions of Europe, Asia, and Africa, were forced high on the mountains; succeeding surges covered them with soil and the shells of fishes; and wherever these deposits were made, are now to be discovered rich mines of coal. Some of these drifts were buried on the plains where eddies were produced by opposing mountains.

expect to find thick alluvial formations. By these deposits, as well as by the returning current, the bounds of the seas, &c. formed by the currents have been much diminished. We find that uniformly, between the seas and gulfs we have mentioned, and the mountains, there are deep alluvial formations. On both sides of hills and mountains not so high as to obstruct the waters in their return, are extensive alluvial formations. At the base of some mountains there is no alluvion. This is the case in regard to the mountains on the south-east coast of Africa. There the soil which was carried over the mountains, was swept away by the current which flowed from the Cape of Good Hope to the north-east. Perhaps no place will more clearly elucidate the effect of these counter currents, than the peninsula of Hindostan. There the waters pouring over the Gaut mountains, formed the sea of Bengal. When the basin was filled as high as the tops of the mountains, that alluvion began to be deposited; the current flowing by cape Comorin to the north-east, prevented the alluvion from extending to the east near the southern part. The current kept open the straits between Ceylon and the main, and moving to the north-east, left a wider space to be filled with alluvion on the east of the mountains, in the centre of Hindostan.

The remains of the larger animals, are more generally found on the plains or in the vallies. If they were left on the sides of mountains, they would be liable to be washed, by rains and tempests, with the soil, to lower situations, while the masses of vegetables, many miles in extent, would resist the force of showers, and retain, by their irregularities, the soil that covered them.

Many of the ruins of the old world, are now far beneath our continent, and even beneath the strata which form its base.

After the first dashing of the waves had subsided, currents were formed into the gloomy caverns from whence our continent arose. As vortices were formed wherever openings were presented, we must conclude, that immense quantities of *exuvia* were drawn into their devouring jaws.*

But it will be inquired, "How the numerous remains of animals were conveyed to the west of the Alleghany mountains and deposited in the vale of the Mississippi, and through the western states, if the mountains proved an insuperable barrier to the returning waves?" That there

* Such is the celebrated vortex of Scylla. The waters which are swallowed there, are conveyed in rents, beneath the ocean to where the burning caverns of *Ætna* turn them to vapour, and throw them forth in clouds from its flaming crater.

are more animal and vegetable remains to the west, than to the east of the Alleghany mountains, is a fact too well authenticated to admit of a solitary doubt, and a fact, which, on examination, goes directly to prove the statements we have made.

It has been stated, that the north-east part of North America was not raised from the ocean, when that part ascended which produced the general deluge.

When the old world was destroyed, America, as far as the Andes, the Alleghany and Stony mountains extend, was made to appear. The Alleghany range terminates in about forty eight degrees north. The Stony mountains extend to nearly seventy degrees. All that part of the continent which lies north of the lakes, and the river St. Lawrence at the time of the deluge, was in the bed of the ocean. The Alleghany mountains extending from south-west to north-east, and the Stony mountains from south-east to north-west, and the Alleghany terminating nearly two thousand miles short of the Stony mountains, presented a coast running from south-east to north-west nearly four thousand miles in extent, and in the most favourable situation for the reception of the waves and relics, which were rolled from the north part of Asia, which was then

the most populous and fertile part of the earth.

The Alleghany and Stony mountains approach each other towards the south; they received the currents from Asia as in a funnel; and perhaps no part of the world was more affected by the deluge than this section of our country.

The accumulation of animals and vegetables which were driven between these mountains, were constantly raised, as their barriers to the east and west approached each other, till the whole current was obstructed by the surges which flowed into the Gulf of Mexico. Here were no rents through the strata to suffer the waters to flow into the cavities below the dry land.

The masses of timber were strewed over the sides of the mountains; the remains of the mammoth, the elephant, and of man were deposited there, and strata of solid earth, many feet in thickness, rested upon them, from which the labour of man and the washing of rivers are almost daily bringing them to light.

The strata of coal which are found on the mountains, were formed by the drifts of timber which were deposited there.

The various quarries of gypsum were loca-

ted there, as in other places which have been mentioned.

There being more deposits to the west than to the east of the Alleghany mountains, is a proof that many remains which were brought to our eastern shores were swallowed by the vortices, which conveyed them to the dreary abyss from whence our continent was thrown.

From the premises we have assumed, the way to the causes of the following effects is easy and plain.

1st. The cause of the ascent to the summit of our mountains and cliffs on the east side, being regular and easy, while the west are precipitate and bold.

The current that returned to the eastern part of this continent, having flowed over the extensive plains of Asia, Europe, and Africa, was loaded with much more soil and relics, than that which flowed across the Pacific ocean. The former having performed more than half its course over mountains and vallies, broken by the violence of torrents from the *windows of heaven*, and from the *fountains of the great deep*; the latter had rolled an equal distance through the Great Pacific, scarcely interrupted in any part of its career by opposing lands. Hence, more alluvion was brought to our coasts from the east than from

the west, and was thrown over our plains, and even to the summits of many of our mountains.

2d. The cause of the capes on the east of America, and west of Europe and Africa, being uniformly turned southerly; while those on other coasts, are as regularly inclined in an opposite direction.

The alluvial formations at the capes, were made when the waters returned from the destruction of the old world; and the waves rolling over the solid parts of the capes, deposited the alluvion on the south-west of the promontories. The other current returning in an opposite direction, formed the alluvion of the capes, on the north-east sides of the mountains.

3d. Why some islands are thickly covered with rich alluvion, while others are left with scarcely soil sufficient to support the smallest growth of vegetation.

The islands in the great southern ocean, most of those in the Pacific, and many in high latitudes to the north, are almost wholly destitute of soil. These islands being scattered in extensive oceans, not defended by any considerable mountain from the fury of the waves, were divested of the soil by the currents passing rapidly over them, when flowing in both directions.

But the islands situated near the coasts, and defended by the mountains of the continent, are in general distinguished by a deep and fertile soil. Such are Madagascar, Ceylon, and many others which were equally defended. The islands near the coasts, east and south-east of Asia, have, from the earliest ages, been noted for their rich and luxuriant soil. Where these islands are situated, the currents which encompassed the globe came in contact, and here they deposited much of their burdens. On these islands, coal in abundance is found, and vegetable mould seems inexhaustible.

While the islands of Austral Asia are fertile in the extreme, many of the islands of Polynesia, situated in the same latitude, are barren and desolate.*

* The Sandwich isles, and several individual clusters in the Pacific, are represented as fertile. But it is generally believed by navigators, that such islands are volcanic productions, are of recent formation, compared with many others, and have doubtless arisen since the deluge. Thus they retain all the *debris* of their own mountains, which renders them abundantly productive. Islands have been formed by two different operations of nature, or of nature's agents—by internal fires, and the coral. The latter in their works are slow and steady, the former is instantaneous.

.PROOF XVI.

Of Inundations subsequent to the General Deluge.

We have on record accounts of three floods, which partially inundated the globe several centuries after the general calamity, when all flesh suffered, and every green thing was destroyed.

Partial inundations may have been occasioned by the subsidence of lands as well as by their elevation. A part of a continent, or a large island settling into the deep abyss from which it arose, would agitate the waters, and propel the surges over the adjacent lands. When lands are depressed into the deep, the waters will not return to their former bounds, but will be raised in proportion to the quantity of matter which has been depressed.

The Flood of Oxyges.

Four hundred and fifty-two years after God saw fit to drown the old world, the flood of Oxyges took place.

The situation of the world at that time was such, that large islands may have arisen, or a great part of a continent may have submerged, and no account of the catastrophe be transmit-

ted to posterity, or no more of the effects than fell under the immediate observation of a few individuals.

The greater part of space occupied by the waves of the Mediterranean, if we may judge from the observations of enlightened and inquiring travellers, bears evident marks of once being covered with land, and that by some convulsion of nature, it has been involved in the waters. By the subsidence of a small part of the land which filled that extensive basin, the waters would have been driven over the south-east part of Europe, and west part of Asia, and the affrighted survivors would not surmise from what cause the waters were put in motion. What effects that flood had on the adjacent countries in Africa, and on the west of those in Europe, is not known; and it is more than probable, that those sections of the world were not inhabited.

From the few accounts we have of that calamity, and from the situation of the countries which were overflowed, we are induced to believe that the flood of Oxyges was occasioned by the submersion of the lands, formerly occupying a part of the channel now covered by the Mediterranean; and that no lands but those bordering on the coasts of that sea, experienced any inconvenience from the event.

Flood in Ethiopia.

One hundred and eighty-eight years after the flood of Oxyges, an inundation took place in Ethiopia, and we have no account of this flood in any other part of the world.

The prophet Isaiah alludes to this catastrophe, when in speaking of the country, Ethiopia, he calls it, *The country whose lands the rivers have spoiled.*

The Chronicle of Axium is the most ancient repository of the antiquities of that country, a book considered as first in authority after the Holy Scriptures; it says, that Ethiopia was laid waste by a flood, and the face of the country much changed and deformed, so that it was denominated *Oure Midre*, or the country laid waste. Other historians speak of this flood in Ethiopia also, and it must have been well known in the times of Isaiah.

The situation of Ethiopia is remote from any ocean, and could not have been directly overflowed by the agitation of waters, occasioned by either the elevation or submersion of land. But the elevation of lands by a secondary cause, could have produced the flood here spoken of. It is evident, from the account we have of that event, that it was not produced by the waves of the ocean, but by the rise of

rivers; and we cannot conceive that rivers in that warm climate, would have arisen above their usual periodical height, but by an unusual fall of rain. Then why should more rain be poured out upon that country, at that particular time, than in any period since, or before, except at the universal deluge? Singular effects must arise from singular causes.

When from the position of the sun in the ecliptic, in regard to the mountains of Ethiopia, the current of air is brought in an oblique direction against them, the vapours which are brought by this current are condensed against the sides of the mountains, and cause their periodical rains. These rains raise the Nile, and other rivers in Africa.

Then may we not indulge the conjecture, that at the period when New Holland was summoned to appear, that the vapours which arose from the ocean, when the waves were repelled by the fire which had force to elevate so extensive a country, were borne by the regular trade winds to Africa, and there condensing as they inclined against the mountains, were the cause of the *rivers spoiling the lands*.

New Holland is situated so remote from Africa, that the agitation of the waters occasioned by its ascension, would have so much

subsided before they reached the east coast of Africa, that they would not have inundated that part of the world. Besides, the vast extent of ocean to the south-east and west from New Holland, offered a free passage to the water, that no country was essentially injured by the rolling surges.

Of the Deucaleon Flood.

Eighty-six years after the flood in Ethiopia, that of Deucaleon happened.

It is not doubted by travellers, but that Africa once extended farther to the north than it now does; and that that part which extended from cape Bon to cape Razat, has settled in the ocean at some unknown period. When that section of land descended, the waters were repelled, and flowed in a direct line to Thessaly, and deluged that country. This was the Deucaleon flood, and this was the cause of that inundation.

Many other partial floods, of which we have no account, may have taken place in other countries, and assisted in the alluvial formations, which begin to attract the attention of the curious and learned, and which will open an extensive field to geological inquiry. Such inundations may have assailed districts, and

none be left to report the calamity. Many barbarous tribes may have been buried beneath a flood, and no monument of their existence remain.

If the dry land was caused to appear, as has been stated, and various parts of the earth have been elevated at different periods, we must expect that great changes have taken place on their surface since their ascension.

Before vegetation commenced its growth, when the soil was not bound by roots, nor defended by leaves and brambles, storms would carry much soil and *debris* from the mountains, and deposit them in the vallies and abysses between the broken cliffs. When rivers began to flow, they formed lakes and ponds in vallies, which continued to rise, till, overflowing, or bursting their barriers, they rushed to others, and with accumulated force, opened a passage to the ocean. By such operations of the elements, fragments of mountains have been undermined, and precipitated from elevated stations, have broken, and thrown inferior rocks to great distances from where they were first deposited. As water filtered through chinks of rocks and mountains to form springs, by degrees it has worn away the foundations of incumbent strata, which settled into the caverns, and occasioned many depres-

sions in the sides and summits of mountains. Rivers have changed their courses, and in forming new channels, have deposited more alluvion in the still waters where they disembogued. Vegetable mould has in many places been borne by currents, and left on lower soils, where now various strata are distinctly seen.

When fire, the servant of the Most High, had performed his office in raising lands for the habitation of the nobler animals, the water and air commenced their operations to mould and polish them for the comforts and conveniences of his creatures. These operations are daily continued, and though they may prove injurious to some, yet they increase the happiness of the general whole.

A Flood was produced by the rise of the north-east part of North America.

It may be considered presumption to introduce arguments to prove a position founded on conjecture. But when witnesses, collected from various directions, voluntarily rise and testify to a fact, we cannot be so sceptical as not to listen to their testimony, though we have no records, and but a ray of tradition to support us.

Such is the case as it regards the flood which we believe has taken place in North America,

long since the general deluge, and the subsequent floods which we have mentioned, and which partially inundated the globe.

We believe that this flood was occasioned by the rise of the north-east part of America, which lies north and north-east of the great chain of lakes, including Labrador, New-Britain, North and South Wales, and all the regions from the termination of the Stony Mountains, to where the Alleghany range disappears near the river St. Lawrence.

The reasons we have to induce us to believe that such a flood or event has taken place, are,

First. The whole strata of rocks, and ranges of mountains, south and south-west of this section of the continent, extend nearly from north to south; and the strata and mountains north and north-east of the lakes have no appearance of ever having been united with the more southern ranges, and uniformly run from east to west.

Second. In that part of the continent recently raised from the ocean, there are no alluvial deposits, which would have been as numerous and as great there as in any other part of America, if that section had been as long above the bed of the ocean, and conse-

quently been subject to the same currents and inundations.

Third. By the rise of that part of America, a flood would have been occasioned, which in its progress would have formed an alluvion, perfectly coinciding with the various strata found in the more southern parts of North America.

Fourth. The Aborigines of North America have traditions of a flood, which more resembles the one we have mentioned, than the general deluge.

With such grounds for our conjectures, we will proceed to examine the effects which such a flood would have on our continent, and compare them with those which are known to exist.

Labrador and Greenland, extending many degrees to the east of that part of the continent which was first raised, in their ascension would have propelled the waters of the Atlantic to the south in great agitation, and likewise would have poured an irresistible current over most of the lands of the United States.

When the last raised section united to the one which had been formerly elevated, there would be appearances of chasms or fissures.

This is the appearance along the whole line of lakes, from Ontario to Slave Lake, and even down the St. Lawrence and M'Kenzie's

Rivers from the Atlantic to the Arctic Ocean.

M'Kenzie, Hearne, and others, who have traversed the dreary wilds north and north-west of the lakes, coincide in describing the face of the country as almost entirely destitute of alluvion, and state that in many places to a vast extent nothing appears but naked rocks. If this section of the continent had been as long exposed to frosts and tempests as the others, there would have been sufficient debris and soil to support vegetation.

When that section of country was elevated, the waters which covered it, rushed to the south and south-east, and swept by their tumultuous surges, the soil and all loose particles from the surface, and transported them to more southern regions. As the sea flowed from the elevated surface, and precipitated against the lands which had been raised before, it would make vast cavities, and transport the soil and even rocks to a distance from where they had been located. The basins of the great chain of lakes were chiefly formed and fashioned by this current, and the matter which was swept from their beds is now witnessed in the vast banks of alluvion to the south of their present bounds. In some parts of the lakes, the waters are represented as al-

most unfathomable. In such places, the sounding was attempted between the strata of the two sections raised at different periods.—Doubtless many such chasms exist through the basins of the whole chain of lakes.

Dr. S. L. Mitchill, to whom we are indebted for many facts in geology, informs us, that along the south coasts of the lakes there are so many marine remains, that it cannot be doubted but for a long time the salt waters rolled their proud waves there. This period was before the north-east section of our country was elevated.

It is likewise the opinion of the same learned Doctor, and of others, whose names do honour to science, that the whole extent of flat country round the lakes, was, for many centuries, covered by waters forming an inland sea; and that this sea continued to rise till it overflowed the lands in various places, wore channels through the mountains, and rushed to the Atlantic ocean. Hence, the *breaches* through the mountains, in which the Hudson, Susquehannah, Delaware, &c. flow, were formed.

We beg leave to differ from this opinion in some respects. If the inland sea existed as they suppose, and it continued to rise regularly for a length of time, till it overflowed the mountains, the barriers must have been of the

same height in all the places where breaches were made, or they would not have been overflowed at the same time. The mountains are not of the same height in these various places, therefore could not have been overflowed at the same time by a *regular* rise of the sea; for, when the waters surmounted the mountains where they were the lowest, at that place the waters would flow off, a channel would be formed, so that the sea would not rise higher, and but one breach would be made. If the sea had first burst over the high lands, where the Hudson, or any one of the other rivers now flows, there must have been a depression of the waters in that place, and all the waters in the sea would have inclined to that place, and the pressure in other places would have been diminished, that no more rents could have been made from this sea.

But the rents must have been made by a sudden rise of the waters, and by a pressure so violent, that the solid strata of the mountains, where the rivers now flow, were torn asunder at the same time. This sudden rise and irresistible pressure, were the effects of the rise of that part of America north of the lakes.

Previous to this inundation, the situation of North America was very different from what it

is at the present time. The ocean extended much nearer to the bases of the mountains than at present, so that most of the plains along the coasts of the Atlantic were then covered by the waters of the deep. The gulf of Mexico then covered a great part of the Floridas, Alabama, Mississippi, Louisiana, &c. On the north-west of the Alleghany range of mountains, there was an extensive sea-coast from Nova Scotia to the northern termination of the Stony mountains. Rivers flowed from the north-west sides of the Alleghany mountains into this ocean. The higher plains and sides of mountains were covered with forests. The continent had become the abode of many species of the brute creation, and man had found a residence here.

The effects of the flood we have mentioned, are to be traced in the various windings of our sea coast, in the bays, rivers, and alluvial formations in every part of our country.

When the northern lands arose, from Labrador and Greenland, a heavy current was sent to the south in the Atlantic, which flowed along our coasts. From the more western regions, a torrent which swept over the lands was sent forth. The current which flowed down the ocean being unobstructed by barriers, preceded the one which rolled over the

lands; and where these two currents met along the coasts, alluvial deposits were made.

When the torrents poured over the mountains, between New Brunswick and Maine on the south-east, and Canada on the north-west, it excavated most of the basin of the bay of Fundy. Nova Scotia rested on strata not to be shaken. When the current which rushed over the lands came in contact with that of the ocean, the extensive sand banks, south and south-east of Nova Scotia were formed. The torrent moved over the New England states in awful grandeur, rolling rocks from the mountains, and driving them in broken fragments along the plains. Hence we have a cause of the many rounded stones being strewed over that part of the continent; and likewise the cause of there being but little soil, and alluvial deposits in the north-east parts of the Union. South of Massachusetts, Rhode Island, and Connecticut, the torrent which rolled over the land encountered, nearly at right angles, the swelling ones which moved along the ocean. Long Island is the effect of their junction; and the sand banks south of cape Malabar are the deposits made by that part of the current which flowed over the east parts of Massachusetts, and was obstructed by the ocean.

Hence, we have a cause of the alluvion of Long Island, being composed chiefly of rounded pebbles. That a heavy current flowed from the east to the west, along the ocean south of New England, at the time Long Island was formed, appears from this. The island not extending so far to the east as the main land, shows that a force from the east, more powerful than from the north, urged the soil and remains, which were borne by the currents further to the west, than if the current from the north had been resisted by an ocean in tranquillity.

In the tract of country through which Connecticut river flows, are the vestiges of many small lakes, which have been partially filled by alluvion. These were filled at the period above alluded to, and the channels of many smaller rivers were covered, and that in which the grand Connecticut rolls his waves, was then formed.

In various parts of New England, large stones and rocks have been found in alluvion, many miles from the strata to which they evidently once belonged. These were moved at the same time that the lakes were filled.

The current of the ocean overspread all the low lands of the Atlantic states, and was enjoying uninterrupted dominion where our

largest cities, delightful plantations, and luxuriant farms, now appear. But suddenly its regal sway, its imperial authority, was attacked. The waters which had been confined beyond the mountains, as if ambitious of a nobler sway, now burst the bounds that had confined them, and with an irresistible impetuosity rushed to attack the ocean, which had extended beyond his natural domains, and presumed to assault the mountains.

The majestic Hudson elated by the conquest of the firm barriers that confined him, armed with the soil and fragments of the mountains he had conquered, in awful grandeur, overspreading the country, dared dispute the power of the ocean. Accelerated by the numerous auxiliaries from the mountains, and strengthened by arming himself with every rock that opposed his passage, the ocean himself retired at his approach.

But from the attack of the powerful Hudson, who moved from the mountains of freedom, the tyrant ocean would have held his dominion over the most luxuriant parts of the middle and southern states. He would have extended Long island to the highlands of Jersey, and destined the site of the emporium of the new world to be a stagnant marsh or a barren plain. But Hudson turned the proud

currents of the ocean to the south, removed the sands and rocks which would have united the island to the maine, and preserved a harbour unequalled in the world.

The alluvion on which the city of New-York is situated was formed at the time when the Hudson rushed to the ocean. It was opposed by a current from the east. The river then overspread all the flat country, and bearing debris, stones, and rocks in its current, when obstructed in a degree by the current of the ocean which flowed through the sound, it deposited much of its burden in the angular point between the currents. - But most of the debris, stones, &c. which were brought from the mountains by the Hudson were deposited on the Jersey shore, and appear in the extensive alluvion which forms the southern part of that state. The current of the ocean inclined that of the Hudson to the west, and both being obstructed, the alluvion was formed to the west of the channel of the Hudson.

The greater part of the state of New-York at that time was inundated. The extensive plains of alluvion were then formed, and to that event it owes the fertility of its soil.

The alluvion on which Troy and Lansingburg have their delightful situations, was formed by the soil, brought by the Mohawk

river, and when its current was obstructed by the Hudson the deposits were made on the east side of the latter. There is not a plain or valley, lake or river, or alluvial formation in the state of New York, which has fallen under the author's observation, but bears testimony in favour of this inundation having taken place. The various strata through which is cut the Grand Canal, the pride of America, the immortal glory of its projectors, bear incontrovertible proofs that such revolutions have taken place.

The Delaware and Schuylkill Rivers.

After the current of the ocean had been checked in its progress to the west by the violent attack of the Hudson, it began again to encroach on the bounds destined to be the abodes of intelligence. Then the overwhelming torrent which rushed through the *breach* formed for the Delaware, assailed the ambitious tyrant, and rescued from his desolating power delightful and fertile regions.

The debris brought from the mountains and high lands by this noble river, were deposited along its sides, when the force of the current was lessened by its coming in contact with the ocean. But most deposits were made on the

east of the river, or bay, where the force was affected by the current of the Hudson and the ocean. The current in the ocean began to incline to the west after it was propelled to the south by the Hudson. The force of the Hudson and that of the ocean then were united; and when that of the Delaware rushed in contact with them they were both again driven to the south. Between these currents most deposits would be made, and directly between them the extensive alluvia in the south part of New Jersey were formed.

The large estuaries or bays at the mouth of our rivers were not formed, as some have imagined, by the streams wearing away the solid earth, but by the force of the currents preventing debris from settling there.

The current of the Delaware was so rapid that it maintained its course to the ocean, and swept the soil which was borne in its waters to southern regions. Where eddies were produced by counter currents, deposits would be made. Between the Delaware and the torrent which then rushed down the channel of the Schuylkill, was formed the deep and extensive alluvion on which Philadelphia is situated.*

* Our limits will not admit of our mentioning the various remains which have been found deep in the earth in the places we pass. Therefore, it must suffice to say that in all of the alluvia which we

The torrent of the Delaware, like that of the Hudson, overflowed a vast extent of country, and the whole current, blended with that of the ocean, moved to the south. Many less streams from the mountain on the west, rushed to this general current, which inclined the collateral streams to the south, from where they would have flowed, had they been uninterrupted; and the general current from the north, drove the soil which the streams from the west brought from the mountains, to the south of the channels. Hence, we have a cause of the banks of alluvion, on all the rivers which flow from the west into the large bays or ocean, being deposited on the south of the channels. The streams, which now are small, at that time were extensive and powerful torrents, as their channels indicate; and where now are dry and fertile vallies, then flowed majestic rivers.

The soil and debris which the Brandywine brought down its channel, was driven to the south by the general current of the Delaware, and formed the delightful situation on which Wilmington stands. South of Wilmington, where Christiana creek now creeps along,

name, timber of various kinds, animal remains, &c. have been found at various depths from ten to one hundred feet from the surface; and the various strata of earth are such that none can doubt but they have been deposited by currents.

flowed a large river, and the burdens which it bore were deposited to form those fertile flats south of the borough, and even the pleasant heights where Newcastle is situated.— Many other streams flowed into the Delaware bay, on the south of every one of which are alluvial deposits.

The Susquehannah.

As the God of Nature never formed a nobler stream, or one which is capable of being converted to more important uses, than the Susquehannah, it is to be expected that such a river would weigh much either in favour or against our theory. Not only the river in its course, but the extensive alluvial deposits which cover the country through which it flows, declare that they owe their existence to a cause similar to the one described.

This noble river rescued from the gloomy embrace of the ocean, millions of acres which now are adorned by rich harvests, pleasant villages, and magnificent cities.

Before the ocean was met by the Susquehannah, he had recovered from the shocks experienced from the Hudson and the Delaware, and was again pressing his forces towards the mountains. Had this noble river been an ex-

perienced warrior, standing on the top of the Alleghany, surrounded by invincible legions, and marked the foe of freedom marching to defile, by his footsteps, the holy sanctuary of liberty, he could not have moved more effectually to repel the baleful intruder. As the accumulated force of the Susquehannah approached, the current of the ocean was again driven from the shores, and turned to the south.

Between the floods of the Delaware and the Susquehannah, was deposited the alluvion, which forms a great part of the state of Delaware, the eastern section of Maryland, and the counties of Virginia which lie on the east of the Chesapeake bay. The Susquehannah, augmented by a thousand streams, and accelerated by precipitating from the mountains, moved with such impetuous force, as not only to turn the current of the ocean, but to preserve from alluvial deposits the space now occupied by the waters of the Chesapeake.

The rivers which flowed from the mountains at the west, laden with soil, rushed to the east, and were prevented from depositing their burdens in the basin of the bay, by being instantly swallowed and borne away by the irresistible current of the Susquehannah.

To the streams which flowed into the bay from the west, are we indebted for the rich and extensive alluvial formations which extend through the centre of Maryland. When these rivers came in contact with the general current from the north, they were checked in their career. As their velocity was retarded, their burdens were deposited; and the whole plains being covered by waters having a motion to the south, alluvion was formed on the south of the principal channels of the rivers.

As innumerable streams laden with various kinds of soil, which they had torn from the hills and mountains from which they flowed, rushed from various directions into the common current, we must expect that many eddies and counter currents would be produced; to these we are indebted for the pleasing variety, the agreeable elevations and depressions of our alluvial formations.*

* Here permit us to notice an error in regard to alluvial strata, which generally pervades society. Many have attempted to calculate the age of the world by these strata. They suppose that a number of centuries would be required to form one stratum, that this stratum must remain as long before it would be covered with a sufficient growth of vegetation to form another, and thus they continue to calculate, proving from these ludicrous premises, that the world must have existed for millions of centuries. All the strata of alluvia may have been formed in as many hours as they calculate millions of years.

If, as we have supposed, a section of a continent or island was covered by water, that many streams from various directions, and flowing

More alluvial deposits were made along the course of the Susquehannah than on any river in the United States, which flows into the Atlantic; and, according to our theory, the cause is obvious. The Susquehannah forms a channel nearer to the mountains, than any other river in the United States which flows from the north to the Atlantic. The currents and debris from the mountains, were obstructed in their course by the current of the Susquehannah, and united their forces with that majestic stream, while the Delaware, Hudson, &c. were supplied only by streams which were of short extent. Hence, Connecticut river has less alluvion than the Hudson, the Hudson less than the Delaware, and the Delaware less than the Susquehanna.

That the torrent which rushed down the channel of the Susquehannah was more power-

through different soils should rush into that water, and there be obstructed or turned by a superior current, strata of different kinds would be immediately formed. For instance, the alluvial formations around Baltimore, and more instructive ones are not on the globe. When this part of the country was covered by water, if one torrent had passed through a sandy soil when obstructed, a stratum of sand would be formed. Another flowing into the same waters passed a clayey soil that would have a stratum of clay, and so were formed all the various strata which have induced so much speculation. In some countries hundreds of strata are formed, where there is but one in another. Many of our strata of alluvia are irregularly inclined, some form a curve, all depending on the situation of the bottom of the waters into which the streams flowed.

ful than any river to the east, appears from the larger bay which it preserved from alluvial deposits, and the uniform course which the current maintained to the south. The streams which poured into this current could not alter its direction.

Much alluvion was formed when the Potomac was interrupted by the current which rolled down the bay. Between the streams of the Potomac, and that which then rushed down the East Branch, the elegant site of the Capital was formed.

At this time, the valley west of the Blue Ridge was filled with water, and the Shenandoah acquired strength to force a passage through that lofty range.

Most of the alluvial deposits on the west of the Chesapeake were made by the debris which the Potomac, York, and Rappahannock, brought from the mountains.

When the James river, as if ambitious to share in the conquest of the Susquehannah, precipitated to the general current, the attack was so violent, that the current of the Chesapeake was turned to the east, notwithstanding the pressure of the ocean. Hence was caused the abrupt termination of the bay on the south, and hence the cause of the channel to this bay

running in a different direction from the bay itself.

The alluvion formed by the James river was deposited south of that stream; and the force of the current in the Chesapeake, or Susquehannah, and that of the ocean, was so much obstructed by this stream, that the alluvion was not conveyed to a great distance from its union with the bay; it was deposited before it arrived to the Dismal swamp. That extent of low land is but a faint picture of what most of the Atlantic states would have been, had not the recent flood made extensive deposits along our coast. The soil which was brought by the Susquehannah and its branches from the mountains being deposited, and James river retarding the current which flowed along the coast, the alluvion which that river bore in its surges, was not swept so far to the south as that of other streams; and the Dismal swamp between North Carolina and Virginia, remains a gloomy witness in support of our theory.

The Roanoke, with its floods, preserved from alluvion Albermarle sound.

The Tar and Neuse defended the space now covered by the waters of Pamlico sound.

After the Susquehannah and James river had exerted their force in repelling the current of the ocean from our shores, none of the

rivers to the south had force to resist its violence.

The current which had been pressed among the mountains had in a great degree lost its force before it arrived among the mountains in the south of Virginia, and the Carolinas, so that when it burst passages to the ocean, it did not flow with such impetuosity as in the more northern states.

From Pamlico sound, where the Tar and Neuse exerted their strength, the current of the ocean inclined to the west. Along the coast of the Carolinas and Georgia, from the situation of the ranges of the mountains, the rivers had but small effect on the surges of the ocean.

The Apalachian and Cumberland ranges of mountains, running nearly in the same direction as the currents flowed, were not so much exposed to their fury as the same ridges further to the north, where they incline to the east, and present their sides to the force of the waves.

These mountains were an insuperable barrier on the east, to the immense current which rolled down the vale of the Mississippi. When this current passed the southern bounds of the Alleghany mountains, it met the triumphant surges of the Atlantic. The current which

rushed down the vale of the Mississippi, turned the force of the ocean again to the south and south-east. On the coast of Georgia the waves of the ocean were first opposed by the flood which pressed through the interior of North America; and there the coast, which is alluvial, is again turned to the south. The alluvion of East Florida was formed at that time: That peninsula lies directly between the two currents, or where they came in contact with each other, and where the most soil would be deposited.

The West India islands, being situated between these currents, received much of their luxuriant soil at the time of this flood.

But the states bordering on the Gulf of Mexico, were most affected by it, and even they owe most of their formation to the current which rushed down the vale of the Mississippi. The waters of the gulf were raised to a great height by the pressure of the flood in the Atlantic. When they were attacked by the force, which rushed down from the north on the west of the mountains, the vast alluvial deposits which form the greater part of those states were made.

In the alluvial formations north of the Gulf of Mexico, various remains are found, which clearly prove that that branch of the ocean

once extended far to the north of its present bounds.

In Opelousas, west of the Mississippi, a human skull and many other bones, were found at the depth of thirty feet below the surface of the earth. The bones of an elephant were found in the same place.

These bones were deposited there by the returning waves of the deluge, and the strata of alluvion were spread over them by later inundations, more particularly by that which we have last described.

In Alabama, fifteen or twenty feet below the surface, is a stratum where wood is found of various kinds, partially decayed. "Beneath this and a concomitant body of clay and soft lime-stone, is a substance resembling the grass on the margin of the ocean, and accompanied by numerous marine shells."

Where the grass and marine shells are deposited, was the shore of the ocean before the last flood. The wood felled by the current from the north, was transported to the south, till it met the waves of the ocean, and then was overwhelmed and covered by the soil which rushed in the torrent down the Mississippi.

"Charcoal and ashes were found fifty feet below the surface, near Elkton, at the head of the Chesapeake. There was also a parcel of

burned brands, or species of wood, charred at one end, and found at the same depth. These were birch and beech, and though soft, sufficiently to be ascertained and distinguished.— On many of the pieces there were marks of edged tools, and of their being split by human hands.” These deposits were brought to their present situation by the waves of the general deluge, and were covered by the debris which the surges brought from the mountains, as they rolled back from their first impulse; and they were still secluded deeper from light, by the alluvion which the Susquehannah brought upon them when it forced a passage through the mountains.

These deposits may have been the effects of the inhabitants who peopled this part of the continent previous to the last inundation, which must have been totally destructive to all who had their residence in vallies or on the plains.

The petrified bones of a whale were found near the mouth of the Patuxent. The carcass of this animal must have been brought by the returning waters of the general deluge.

It appears, from various and most respectable sources, that in Virginia, and other of the southern states, at the distance of an hundred miles from the ocean, far beneath the surface of the earth, are many marine deposits. The

shells of fishes, the bones of sharks, whales and other monsters of the deep, are frequently brought to light in digging ditches and sinking well in that part of the country. These were conveyed there by the waves, when they returned from completing the work of destruction in the old world.

When streams descended from the mountains, the debris was thrown over these victims of the deluge. When the inundation rushed from the north, these remains were buried still deeper from the light of heaven.

In the stratum of coal in Rhode island is seen a mass of vegetable productions, transported from the old world by the current, which in its return flowed over the New England states, and when it was met by the surges of the ocean, the force of the current abated, and there the mass of vegetation found a residence. The last flood was opposed in the same place in a similar manner, and left a stratum of alluvion above this consolidated mass of vegetation.*

* It is well known that the coal mines opened in our country, do not afford coal so pure, or free of earth, as those in the eastern continent. The cause, from our theory, is obvious. The matter composing the coal brought from the eastern hemisphere, was more exposed to the fury of the waves than that which was deposited near the plains on which it grew. That which was transported here in waves mingled with sand and mould, when deposited was agitated by the currents, and became perforated with earthy particles.

The mines of coal which have been discovered near Pittsburgh, and various places along the Alleghany range, are but lightly covered with soil, though some parts of the strata dip deep in the mountains. The vegetables, or vegetable mass which formed these strata of coal, was brought, as has been observed, by the returning current of the deluge; and many of these deposits were fixed so high on the mountains, as not to be affected by the subsequent flood.* Parts of the mountains on whose sides these deposits were made, have, by the decay or revolutions of ages, been undermined, and they have fallen on the strata of vegetables which adhered to them.

The delightful situation of our **CAPITOL**, at Washington, is as instructive to an inquiring

* Coal, possessing properties so different from what is discovered in the growth of vegetation at the present era, will doubtless induce some to believe that it is not formed of vegetables. But we would observe, and shall attempt to prove, that there have been great and essential changes in the climate on the surface of our sphere. The constitution and form of the various species of the brute creation have changed; man has changed in many respects, and vegetation is more immediately affected by the climate than any of the animal creation. Vegetation, before the deluge and the change of seasons, possessed various properties which it does not now possess. Plants and trees of the torrid zone, are very different from those of the temperate and frigid, and when there was no variation in the seasons, it must be expected that vegetation would be very different from what it is when subject to alternate changes from cold to heat. If vegetation, before the deluge, possessed more of the pitchy substance than it now does, as it is rational to suppose it did, the various properties of the coal are easily accounted for.

mind, as we trust it will ever be eminent for the wisdom and piety by which our national concerns are conducted.

“Capitol Hill is more than eighty feet above tide-water. Digging has shown that all the strata are horizontal; and the pebbles and stones mingled with the sands, are rounded, as if rolled by water.

“Under this mass of alluvial materials, organic remains exist. They lie in a stratum of muddy clay. Trunks and branches of trees are found in abundance, at the depth of fifty-four feet under the surface of CAPITOL HILL; frequently the wood is black, and so as to resemble coal, and is mingled with pyrites.”

The base on which the above mentioned remains were found, was the surface of the ground before the last inundation. The fifty-four feet of solid earth above them, was brought by the accumulated current of the Potomac, when it forced a passage through the mountains, and was opposed by the waters of the Chesapeake, and those which rushed down the East Branch at the same time, and which have been described.

Alluvial deposits beneath Philadelphia, are similar to those at Washington, and were formed by the same cause. New York stands on similar deposits, and all sites near

the junction of large rivers, have but little variation in the strata on which they rest.

In the vale of the Mississippi, or west of the Alleghany mountains, is a rich and extensive field for geological inquiry.

Far beneath the surface, below many strata of alluvia, have been discovered the bones of the human race, promiscuously scattered where once was the surface of the earth. Remains of various lower species of the animal creation, are mingled with the lords of this lower world. Nearer the surface, are likewise found remains of man, of various species of the brute creation, timber in an entire state, parts of chimnies, and various utensils, which were designed for religious or domestic use.

The lower stratum of bones, or relics, were brought to their present places of rest by the waters of the deluge as we have noticed. The upper stratum was formed by the recent flood, which we have attempted to explain. That the timber or trees which are buried in alluvion, were buried by the cause which overthrew them, appears evident from these facts. They have bark, leaves, and even fruit upon them. Had they been prostrated by a tempest, and lain on the surface of the earth till covered by decayed vegetables, or the increase of soil, the fruit, leaves, bark, and even the

wood itself would have been destroyed, or worn marks of decay. The subterranean forests of Europe, were swept down and buried by the torrents of the general deluge; the trees in America which are found entire, were buried by a similar, though a subsequent cause.

That the remains of chimnies, and various implements which have been brought to light by the washing of rivers, and by digging, were instantly covered, appears from many facts. Had they not been instantly covered, they would have worn more marks of decay than are now stamped upon them. By the washing of the soil, by common tempests, many centuries would have been required to cover some remains, now deeply buried in our country, and even the remains themselves would have mouldered away, before a sufficiency of soil could have been formed to cover them.

Many rivers once flowed in our country, which do not now appear, nor are their courses to be traced but by marks here and there impressed on the rocks, which must have been made by a long continuance of regular currents.

We have stated that before the last inundation, many rivers flowed from the north-west of the Alleghany, into an ocean which covered

the north-east part of North America. The traces of these rivers are discovered in many places on the rocks near the lakes.

When rents were made through the mountains, and by alluvial deposits on the south of the lakes the surface was raised, the channels of the former rivers being filled, the courses of the rivers were directed to the southward.

The channels of the Ohio, and its numerous auxiliaries, were formed after the late inundation, and they marked their courses where the least obstructions were presented. It appears that their channels have not long existed, by the numerous remains that are seen in the sides of the channels their waters have formed. The majestic Mississippi commenced his course after the rich alluvial formations were made between the Alleghany and Stony mountains. This appears in the whole course of the channel of that noble river, and from the situation of the alluvial deposits, which it is evident that that stream has recently made. No river in either hemisphere, has its alluvia deposited like the Mississippi.*

After the principal alluvial formations were made as we have described, and the grounds began to be covered with vegetation, when

* The reader is referred to Dr. H. H. Hayden's ingenious and able publication on that subject.

evaporation and rains increased, new rivers began to flow. Then streams entered vallies, and formed lakes. Other rivers wore channels to the same reservoirs; they rose, till overflowing or breaking their bounds in the lowest or most tenable places, they rushed to the ocean. These causes have produced great changes in the appearance of the surface of our country.

The numerous small lakes which are so delightful in the north-west part of the state of New York, are formed in this manner. These lakes were once more extensive than they now are. As the streams which form the out-lets to these lakes wore their channels deeper, the waters of the lakes would decline; which has evidently been the case with most of the small lakes in our country.

Lake Champlain once covered lands several hundred feet above the present surface of its waters. It continued to rise, till overflowing its bounds to the north, it found a passage to the river St. Lawrence; and as the channel of the Sorel was deepened, the lake lowered to its present bounds.

Our limits will not permit us to describe more places which bear evident marks of the revolution we have mentioned. In almost every part of our country, abundance of such

marks are to be found. The sides of our mountains, the beds of our lakes, the channels of our rivers, the plains and vallies, rocks and precipices, and even the stones and pebbles in language which cannot be doubted, nor misconstrued, all testify of this catastrophe.

All the Indians in North America have a tradition of a flood which they say "overflowed the lands and drowned the whole world, except the highest mountains. To these retreats some Indians fled and were saved from the raging floods." Might not this with more propriety be referred to the flood just described than to the one in which all flesh suffered, and from which none but Noah and his family escaped?

The query may arise, "when did this catastrophe happen?" We have no data from which we can decide in what year or century this great revolution took place. But would it be inconsistent to suppose, that when the sun was darkened, when the rocks were cleft, when the veil of the temple was rent in twain, when the astonished heathen philosopher exclaimed, "The world is coming to an end, or the God of Nature suffers." When the Son of Righteousness was crucified, would it be inconsistent to suppose, that at that eventful

crisis, when fear and consternation pervaded the world, that this great event occurred?

PROOF XVII.

Of the Prairies of North America.

Most of the extensive flats or meadows in our country, west of the Alleghany mountains, were formed by the flood from the north.— These natural meadows are, in general, destitute of every species of vegetation except grass. In some of them are elevations of land, which are covered by a heavy growth of timber.

Some of the prairies, or meadows, may have been divested of timber by fires, which have been frequently put to them; but those which have rises of timber-lands in them, could not have been formed by fire; for the higher lands would have been as much exposed to the fury of that element as the lower surface, and all the timber on the elevations would have been destroyed.

Most of the prairies are of alluvial formations. This appears from the many animal and vegetable remains which have been found far below their surface. Below a thick stratum of vegetable mould, sand, gravel, and rounded pebbles are found, which proves that

lakes, or arms of a sea or ocean, once rested there.

The basins of these lakes were formed when the country was overflowed from the north.— In many places, by the projections of the mountains, or by counter currents, eddies to a great extent were formed. By the constant whirls of the waters, the surface of the ground became excavated; so that when the floods subsided, lakes remained in these basins. The elevations now covered by trees, were islands in these lakes. As the lands became covered with vegetation, and streams began to flow, some of which were channels to the small lakes, the waters rose, and overflowing their bounds, formed channels, which have drained off the waters from the basins, which now are enriched by a thick vegetable mould, which was deposited there by the streams which previously flowed into them. They remained lakes so long, that all the seeds of vegetation, which had been transported to them had decayed. The seeds of various grasses first took root in them, and grew so luxuriant, that the seeds which subsequently were borne there received no growth.

The largest prairies in North America, are west of the Mississippi. There more extensive eddies would have been produced. The

Stony mountains were the western barrier to the flood. Where ridges of that range projected to the east, on the south would be an eddy; and in such situations the prairies are found, and extend in proportion to the projection of the mountain.

In this manner the lower prairies were formed. They became covered with grass. This grass, when dry and fired, is so powerful a combustion, that nothing can resist the conflagration. These flames, in many of the prairies, have, by destroying the timber on higher lands, produced a secondary kind, more elevated, not so level, nor of so rich a mould, and the alluvial strata of which they are formed, are variously inclined, and differing much from the strata of the prairies formed in the basins of lakes.

The extensive open plains, called *Pampas*, in South America, are flats, from which the waters retired at the recession of the ocean, or where the bottom of the deep was raised unbroken. These plains are so impregnated with saline particles, that no vegetables, except a kind of marine grass, grows upon them.

These *Pampas* are so level, that there are no streams to bear away the salt particles, and their situations are so far from the mountains, that no soil nor debris is transported to them

by storms and tempests; and not having been inundated since the waters retired, no alluvion has covered them. They have remained century after century, enriched by the decay of their own productions.

The late flood from the north, being obstructed by the ocean which flowed into, and filled the Gulf of Mexico, did not affect the south part of America in any great degree. The waters were propelled to the northern provinces of South America, and alluvial deposits were made there; but the more southern parts experienced no other effects, or none greater than a small subsidence of the waters, when they retired to the caverns beneath the newly formed section of our continent.

PROOF XVIII.

Of the saltness of the Ocean, and of many Lakes.

The saltness of the ocean, and the situation of the salt lakes, will prove the correctness of our theory.

When our world was moulded to a sphere, the saline particles were equally diffused through the whole mass of matter composing our world. The ocean was then less salt than it now is. When the lands were elevated, and

the streams began to flow, the particles of salt were washed from the soil, and from vegetation, and conveyed to the ocean, or to some other reservoir.

The aqueous particles were raised by evaporation, and the salt remained where it had been deposited. By this process of nature, the ocean has constantly been growing salter.

The truth of this will appear, when we examine the situation of the lakes, whose waters are impregnated with salt.

We have no account of any lake on either continent, or on any island, into which rivers flow, and from which there is no channel to convey the waters to other reservoirs, but what is salt; and we know not a collection of water, which has streams flowing from it, that is so impregnated with salt as to render it perceptible to the taste, or visible in a chymical operation. We except in this, the lakes and ponds, which have the saline particles mingled with their waters by springs which have filtrated through mines of salt.

On both hemispheres are lakes which have no outlets, situated in the same latitude as those which have streams flowing from them; and though in the same soil, yet the former are uniformly salt, and the latter fresh.

When a quantity of water flows into a valley surrounded by hills, and if it does not evaporate as fast as it flows into the depression, it must in time overflow its bounds and rush to the ocean. If at certain seasons more evaporates than flows into the valley at the same season, the valley becomes dry, and is covered with water when more waters flow in the rivers than the heat of the sun raises in vapour. Such are the morasses which are wet in the spring and autumn, and are dry in the summer; and, it is only in these depressions in which waters conveyed by streams are equal to the evaporation that lakes and seas without outlets exist. This is the situation of the Caspian, and Aral seas, of lake Moravi, lake Nor, and several others in the old world, and of lake Titticaca, Salt lake, one of the lakes in the city of Mexico, and several more in the southern part of our continent. These lakes and seas having no streams issuing from them, retain the salt which is brought to them by rivers and torrents.

But, in North America, or in that part of it which was washed by the last mentioned inundation, not a solitary lake of the above description exists, while in South America, and on the eastern continent they are numerous. The basins of lakes and seas in the old world,

were formed by the flood as has been observed, and where there is one whose situation and surface are such, that an equilibrium is formed between the received waters, and emitted vapour, there salt water is found; but, in that part of North America which experienced a second inundation, the floods filled the beds of lakes, and burst a passage for their future collection of water to roll to the ocean. In South America no second flood has prevailed, to form channels for the lakes to discharge their waters, and there they remain accumulating salt, in the same manner as those in the old world.*

PROOF XIX.

Change of Climaté, &c.

As testimony in favour of our system, we introduce the change in the temperature of climate in the old world, since records have been kept.

That the climate on the eastern continent, or in Turkey, Arabia, Italy, France, England, and Germany, is warmer now than it was se-

* Mexico was but little affected by the late flood, from the same causes as South America, and in Mexico are salt lakes. The two lakes in the city of Mexico, prove as far as the subject will admit, that salt lakes are formed in the manner we have stated. The upper lake in Mexico is fresh, a stream flows from that to another, which has no outlet, the former is fresh, the latter is salt.

veral centuries ago, appears evident from many authentic accounts.

The author of the book of Job, who probably was Moses, wrote upwards of thirty-three centuries ago. The country in which he wrote, was Midia, at the east end of the Mediterranean sea, in north latitude thirty degrees. In describing the cold, the author observes, "*Hast thou entered into the treasures of the snow? or hast thou seen the treasures of hail? Out of whose womb came the ice, and the hoar frost of heaven who has engendered it? The waters are hid as with a stone, and the face of the deep is frozen.*"

The seasons then in that country must have been much more severe than they now are; for in that place for several centuries, there has been no ice, frost, nor snow.

The degrees of heat in Farenheit's thermometer, in which large bodies of water are frozen, is about twenty-five degrees, and this is to continue many days. Therefore, in the land of Midia in the days of Moses, the extreme of cold must have been about twenty-five degrees.

David, about four centuries after Moses, gives us a description of what he considers as a cold winter: "*He giveth snow like wool. He scattereth the hoar frost like ashes. He cast-*

eth forth ice like morsels. Who can stand before his cold?"

This the poet describes as the extreme of cold in this warm climate. At thirty-one degrees of Farenheit's thermometer such effects are produced. Hence, in four centuries, there was a difference of six degrees in the temperature of the climate in that country, in the extreme of winter. Now, in Palestine, or Midia, the climate is so warm that neither snow nor ice is known.

From meteorological observations made in countries of about the same temperature as Palestine, as in Cairo in Egypt, the mean temperature of the severest week is forty-nine degrees, which makes a variation in the temperature from the days of Moses to the present time, twenty-four degrees.

The climate in Italy is found to be very different now, from what it was eighteen centuries ago. Virgil informs us, that the rivers were frozen over, as an event which was commonly to be expected. The place where Virgil wrote, was in forty-one degrees north latitude. Pliny, Juvenal, and Aelian, speak of snow and ice as being common. Now, no ice is seen in the rivers of Italy, and where snows usually fell, no frost is known.

A similar change has taken place in the north part of Turkey. At Constantinople, and round the Black sea, the change in the temperature of the climate has been as great as in Italy. Ovid informs us, that he saw the Black sea frozen over, that he walked upon it, and that oxen and carriages passed over it. Tournefit informs us, that in the days of Constantine, the straits of Bizantium were frozen over, and that in 401 the Black sea was covered for twenty days together. In 1607, the Turks were astonished to see some ice at Constantinople. At the present time, nothing of the kind is known in that part of the world.

The same alteration has been observed in the Alps, in Switzerland, France, and Germany. The passage of the Alps by Hannibal, which filled the astonished world with admiration, is now in the midst of winter a journey attended with but few inconveniencies on account of the severity of the weather. The troops of Julius Cæsar nearly perished by the cold in Gaul, where now no frost nor snow is seen.

Diodorus Siculus says, "That the Rhine, and Rhone were frozen," and we have many other accounts which leave no doubt but the climate in the south and south-east parts of Europe, south-west part of Asia, and north

part of Africa, is seventeen or eighteen degrees warmer now than eighteen centuries ago.*

In Africa are many channels of rivers entirely dry, in which majestic streams formerly rolled to the ocean. In Asia, rivers are reported to have sunk into channels far less than they formerly filled. And, in both Africa and Asia, where once were extensive luxuriant fields, are now parched, barren deserts, over which roll oceans of sand.

That the deserts have extended their bounds on the eastern continent, is evident. Palmyra was situated in a fertile valley, though surrounded by barren sands. Carthage had her verdant meadows, pleasant groves, and fertile fields; and, where are they? They are buried beneath heaps of burning sands. Her fountains, her aqueducts and harbours, have been filled and buried by the tempests of sand which rolled from the desert. Modern discoveries have opened to light the remains of magnificent cities to the west of Egypt, over which for centuries the camel and dromedary have travelled, guided by the compass, as nothing of an earthly nature, but an

* For the above ideas and many more which clearly prove that a change in the temperature of climate has taken place on the eastern continent, the reader is referred to Dr. S. Williams's notes on that phenomenon.

ocean of sand meets the longing eye. There must be a cause for these wonderful changes. Why have these sections of the world become warmer? It will be replied, "because the deserts have become larger," and why have the deserts become larger, burst their ancient bounds, and involved in their desolate bosoms, magnificent cities, and renowned monuments of antiquity? Will it not be answered, that God has brought these judgments upon those nations for their iniquity? It is not denied. But our object is to develop the means which the great Arbiter of universal nature employed to punish rebellious man.

It is evident, that the extension of the deserts would increase the heat of the climates of nations bordering on them. To account for the deserts extending their bounds, will be unfolding the cause of the climate of nations becoming warmer.

To account for this phenomenon, on rational and philosophical principles, the mind must be engaged a few minutes in reflecting on the situation of the mountains, seas, and deserts, on the eastern continent, and likewise referred to some of the properties and motions of the atmosphere.

Of the situation of the Mountains, Seas, and Deserts, on the eastern hemisphere.

The principal mountains of Africa lie in the following direction. The mountains of the moon, run nearly from east to west through the centre of Africa.

The snowy mountains branch from the east end of the mountains of the moon, and run to the south-west near the south-east coast of Africa to the Cape of Good Hope. The Lybian mountains branch from the same end of the mountains of the moon, and run inclining to the west of north between the Red sea and the river Nile. The Tibessi mountains run from east to west between the Nile and the desert of Sahara. Mount Atlas extends from north of east to south of west, to the north of the desert through the Barbary states.

The mountains of Asia which we shall notice, are the low ranges near the centre of Arabia; the Gaut mountains on the west coast of the peninsula of Hindostan, running from south to north. The ranges of Tartary running from east to west, Caucasus and Taurus, between the Caspian and Black seas.

In Europe, the Alps, the Pyrenees, and Carpathian will demand our attention. Many

others in those three quarters of the globe, would require attention to give a more minute description of their effects on the winds, than our present limits afford.

In Persia are few mountains or rivers, but many deserts. In the south part of Arabia the soil is fertile; north of the mountains, it is parched and desert. From but little west of Egypt to the Atlantic, between the mountains of the moon, and Atlas, Africa is a desert.

Of the Properties and Motions of the Atmosphere.

The atmosphere is a fluid resembling water, except in density; being much lighter, it floats above it, and presses like water in every direction on the surface of bodies. This fluid in depth, is upwards of forty miles, or extends to that height from the surface of the earth. The atmosphere becomes lighter as we ascend; from pressure being lighter in all other parts than on the surface of the earth. A body lighter than a fluid, will rise and float on the surface. A body in a fluid of different density in various sections, will rise to the section which is of the same density as itself, and there will be supported. This is the state of the clouds; the atmosphere below them being denser than they, and above lighter, the vapours forming the

clouds are supported and are borne as the currents in the fluids incline. Water by heat is decomposed, that the aqueous particles become of less density than the atmosphere, and they rise to regions where an equilibrium is formed. There, when two particles are united, the one that is formed is of greater weight than the atmosphere and descends, uniting with others which are ascending, reaches the earth in a drop of rain, in extent in proportion to the distance it has fallen, and to the number of particles which have united to it.

Every particle of matter composing a fluid, is a sphere, a form, which contains the most matter with the least surface. A sphere divided into two, presents more surface than when in one. Hence, as heat separates particles of matter, the quantity of matter decreasing faster than the surface, and the atmosphere pressing on every part of the surface, they rise and form clouds. The particles composing the atmosphere are alike affected by heat, ascending when warmed, and descending when cold.

The winds or currents in the atmosphere, are similar to those in the water. They flow to warmer regions when unobstructed, as water descends an inclined plain. There are often counter-currents in the atmosphere, as appears by clouds moving in opposite directions.

The currents in the atmosphere are obstruct-

ed by continents, islands, and mountains, and made to flow in various directions from their natural course; as the current of a river is turned by a projecting rock, or by winding banks. This appears evident from the courses of the periodical winds in many parts of the world.

On the equator in the ocean, the uniform current of air is from east to west, following the course of the sun. When the sun is north of the equator, the air near the northern tropic flows to the south-west, and near the southern tropic to the north-west. This is invariably the case where the currents are not obstructed by land. But where continents, &c. oppose, the air is turned from a direct line in proportion to the direction of the coast or mountains which oppose. The current is turned as light is reflected, the angle of incidence being equal to the angle of reflection.

Hence we find, that in the sea of Arabia, when the sun is south of the equator, the winds blow to the south-west, are turned more to the south by the coast of Africa, and passing round the Cape of Good Hope, occasion those heavy storms so often destructive to mariners. But, when the sun is north of the equator, the current instead of moving to the north-west in its natural course, is turned to the north-east.

In like manner the winds prevail in the sea of Bengal, in the Mosambique channel, and in various other bays, gulfs, and seas.

While the lower sections of the atmosphere are obstructed and turned aside by coasts and mountains, the higher sections pass over the barriers uninterrupted. Hence, we often see the clouds moving along, parallel to the mountains, while the lighter ones pass in a different direction, far above their summits.

The lower section of the atmosphere which passes along the torrid zone to the west over the Indian ocean, is obstructed by Africa; Cape Gardafui is the point which divides the current. Part flows to the north, and part to the south-west. That which is turned to the north, has the Lybian mountains for a barrier on the west, and the Gaut mountains on the east. This current passes over Persia and Arabia, and Turkey in Asia. The lower section of that which passes over Arabia, is obstructed by the mountains extending across Arabia, from near the Red sea to the Persian gulf. Here the vapours contained in the obstructed section pressed by succeeding ones, and urged against each other, condense and fall in showers. Hence, the south part of Arabia is plentifully supplied with rain, which gives such fertility to the soil, and luxuriant

growth to vegetation, that the country, is rightly denominated *Felix*. The part of the current which passes above the mountains, and flows over Persia unopposed, and warm from the torid zone, receives the evaporation of Persia, and of the north part of Arabia, and bears it to the north. Hence, the evaporation being borne away, vegetation languishes, the soil becomes parched, and the deserts are formed. Hence, the north part of Arabia has received on account of its barrenness, the just appellation of *Deserta*. This current moves to the north and north-west, till it reaches the mountains of Tartary, Taurus, and Caucasus; here on account of the height of the mountains, it is more fully obstructed, and discharges most of its stores; which supply the rivers Euphrates, Tigris, Gihon, Sihon, &c.

Hence, we have a cause for the scarcity of rivers in Persia and Arabia, and for there being no auxiliary streams to the Tigris and Euphrates.

The current is turned by the last mentioned mountains to the west; part of the current which flows over Arabia, when it reaches the north extremity of its western barrier, the Libian mountains, rushes to the west over the northern part of Africa, sweeping off the evaporation of those ill-fated lands.

Hence, we have a cause for there being rain so seldom in Egypt, and the same cause which produced deserts in Arabia and Persia, occasioned those in Africa, and continues the operation, and to the present time extends the bounds of the deserts.

Hence we have a cause for the rivers diminishing and becoming dry in Africa. Before vegetation ceased to grow, when more rains descended, rivers were supplied in abundance, but as the vapours were borne away, the rivers diminished, till now the weary traveller searches in vain their extensive channels to quench his raging thirst.

Part of the current passes over the Mediterranean Sea, Turkey in Europe, Italy, France, Spain, Portugal, Germany, Netherlands, Denmark, England, &c. to the Atlantic ocean; some parts of it are obstructed by the Carpathian mountains, the Alps, and Pyrenees, and the condensation of the vapours against their sides and summits, supplies the rivers which rise and flow from their bases.

As this current passes over countries and receives the tribute of every land, it becomes so laden with moisture, that it begins to discharge its burthen, before it reaches the Atlantic ocean. The evaporation of Asia is poured out upon France, Spain, Germany,

&c. The current becomes cooler, both from its moving from the torrid zone, and from the vapours with which it is loaded, that it does not receive so much evaporation from the western as from the eastern kingdoms.

Hence we have a cause for its being warmer in Persia, and the north part of Arabia, than in the Turkeys, warmer in Turkey than in Italy, warmer in Italy than in France, &c. Hence we have a cause of there being more rains in Europe, than in the south-west part of Asia; and more in the south-west parts of Europe, than in the south-east. There are more rivers in Turkey in Europe than in Turkey in Asia, more in France than in Turkey in Europe, and more in Spain than in France. The above described currents coming from the torrid zone, and flowing over the most of Europe, render the climate more temperate and mild there, than on our continent, in the same latitude. The current when it arrives at England, uniting with the cooler air over the ocean, forms the fogs which are so prevalent in that kingdom, in Holland, &c.

That current which passes over Africa, meeting with no mountains running from south to north to obstruct its course, bears off more vapours from that quarter of the world, than is carried from Europe. Atlas gathers light

stores, which supply a few small rivers in Morocco, and renders that part of the continent cooler than to the east, in the same latitude. South of Atlas, there is no range of mountains till we arrive at the mountains of the moon, that the current meets with no obstruction in passing the desert. When the sun is nearly vertical to the mountains of the moon, or south of them, the south part of the current which inclines to the south-west strikes obliquely against the sides, and discharges its stores to supply the Niger, Senegal, and Gambia, the rises of which rivers are periodical. When the current which passes Africa arrives at the Atlantic, and mingles with the cooler vapours, fogs are formed as on the west of Europe; and those heavy storms are produced when they spend their fury on the waves of the Atlantic. Here the winds vary, but without refreshing thirsty and parched Africa. When the sun has set, the atmosphere over the desert is rarer than over the ocean, the cold air of the ocean rushes to supply the place of the rarer, by the heat of the burning sands it rarifies and ascends, and is urged by the regular currents in the high regions again to the west. These currents often prove destructive to vessels near the west coast of Africa; when enveloped in the thick fog, they are

dashed on the inhospitable shores. These currents, which we have attempted to describe, we conceive are the cause of the deserts extending their bounds. The currents bear off the evaporation from the countries over which they pass, with the least obstructions, and discharge their stores on lands adjacent to mountains. As the deserts extend, the neighbouring kingdoms become warmer, both from the dryness of the atmosphere, and from the heat it receives from the burning sands. Hence we have the cause of the eastern continent being warmer now than three thousand years ago; and the cause why Midia became warmer before the more western countries.

Thus we account for the cause of deserts encroaching upon, and even covering the sites of renowned cities, and famed monuments of antiquity.

Could the remains of superb cities, for centuries buried beneath the burning wastes, or the magnificent pillars, long secluded from the sight of mortals deep below the sandy billows; could these now speak to us in a language which we could not misunderstand, would they not declare, "That by degrees the refreshing dews and the revivifying showers of heaven, were withholden from them; that the lands became scorched and barren; that instead of exhilara-

ting breezes from the meadows, there came the parching winds from the deserts; that instead of storms of rain to refresh languishing nature, there came tempests of burning sands to bury fainting animation in lasting oblivion." Thus cities, provinces, and empires, were depopulated, towers and temples covered, rivers and harbours filled, and the desolation and ruin, of which travellers bear witness, were produced.

The current of air which we have described, on leaving Africa, moves in an uninterrupted course towards South America, pressing the waters of the Atlantic to the west, which causes the gulf stream as it is turned by the north-east coast of South America to the north-west. But the current in the atmosphere rolls over the plains of Brazil, Guiana, and Amazonia, laden with the moisture raised from the Atlantic, from Africa, the Mediterranean, the south parts of Europe, south-west section of Asia, from the Indian ocean, and perhaps from the fertile plains of Austral Asia; these are propelled by succeeding currents up the sides of the insuperable Andes, which roll back, and the pursuing vapours condense, and descend in the heavy rains and tempests which supply the Amazon, Laplata, Oronoco, and the innumerable tributaries which they bear to the

ocean. These rains give richness and luxuriance to the soil, which are not known in the old world, and the indescribable growth of vegetation which abounds in the countries east of the Andes. Hence we have the cause of the coolness and fertility of South America, while Africa, in the same latitude, is burning with heat, and sterile with drought. Hence, we have the cause of there being so many and large streams in South America, while they are few and small in comparison, in Africa. South America is, in extent inferior to Africa. The greater part of both quarters of the world lie in the torrid zone, both experience the same vertical rays of the sun, and unless some secondary cause opposed, both must endure the same degree of heat and sterility. Yet, South America is cool, while Africa is hot; the former is fertile, while the latter is barren; the one is adorned with the most luxuriant growth of every species of vegetables, while the other is covered with parched burning sands. South America is refreshed by thousands of majestic rivers, flowing pure and rapidly through every plain, while less than one hundredth part in number and size are thinly scattered through Africa, and scarcely move their stagnant waters along their contracted channels.

If no more vapours descended in South America than are raised there, and all had condensed in Africa which the vertical sun put in motion, the latter would be as fertile and copiously watered as the former.

The Andes are so high, that no clouds pass their summits, that all their stores are discharged on the east of that stupendous range, except what is turned to the south-west, and produce the storms at Cape Horn, or to the north-west along the coasts of Terra Firma, whose course and effects will be traced to North America.

That none of these vapours pass the Andes, appears evident from the quantity of rain which falls on the east of them, while in Peru on the west it seldom rains.

The section of the current of air which crosses the Atlantic, and is obstructed by the north-east coast of South America, presses to the north-west along the shores, drives the waters through the Caribbean sea, which with the current of air ranges around the coast of the Gulf of Mexico; the waters turn to the east around the Floridas, while the lighter fluid moves up the vale of the Mississippi, reviving vegetation with the warm and moist particles which it has brought from the torrid zone. This current drives the waters into the

Gulf of Mexico which are elevated against the shore, and is the cause of their being higher there than in the Pacific, on the opposite coast. Hence we have a cause of the climate being warmer on the west than on the east of the Alleghany mountains, in the same latitude.

Thus the evaporation has been brought from the old world, and discharged on the new ever since the general deluge, and ever since that period their deserts have been extending, and their climate becoming warmer.

Before the deluge, the mountains on the eastern continent, in general running from east to west, presented but small barriers to the current of air which regularly followed the course of the sun from east to west, but when America was raised, the mountains ascended in ranges nearly from north to south, a great change was produced in the currents of air.— Then the majestic Andes, whose towering summits project far above the flight of any clouds, opposed the currents of the atmosphere and turned them in various directions. This has been the cause of many changes in climate in the different empires of the world.

PROOF XX.

Of the Rainbow.

For another proof in favour of our theory, we introduce the rainbow as a bright and shining witness.

It will be admitted, that no rainbow appeared in the heavens before the flood. After the waters subsided, God caused it to appear as a *seal* that the world should be drowned no more. But few can be ignorant of the cause of the rainbow. If the cause had existed before the flood, we believe the effects would have been the same as it now is, and the rainbow would have appeared. Before the flood, no clouds appeared in the horizon, or heavens, opposite to the sun, to reflect his light and form the bow. There was no rain before the flood. *For the Lord God had not caused it to rain upon the earth. But there went up a mist from the face of the earth, and watered the whole face of the ground.* This mist was dew, which, when the sun declined, descended and refreshed the thirsty fields.* If any

* If any doubt that dews would be sufficient to refresh the earth, and support vegetation, they are referred to Egypt and Peru, in both of which places the soil is fertile, and the growth of vegetation abundant and luxuriant. If the same vapour descended in the night which arose in the day time, the earth would never thirst. This vapour being borne away, is the cause of droughts; and if vegetation was regularly supplied with moisture, we believe it would flourish to a much higher degree of perfection,

clouds appeared in the heavens, they regularly followed the course of the sun to intercept his piercing beams, or in gentle mists to refresh where he rendered thirsty. Then Africa, Arabia, and Persia, smiled with verdure. But when the firm foundations of the deep became insuperable barriers to the current of the atmosphere, and obstructed the course of the clouds, they were turned by the eddying streams in every direction, and clouds meeting clouds, discharged their stores in copious effusions. Then condensing vapours were brought together, opposite to the sun, and reflected his brilliant beams to the eye of the enraptured beholder.

PROOF XXI.

The Longevity of the Antedeluvians.

In this place, to prove the accuracy of our system, we will introduce the venerable antedeluvians, who, in juvenal sports and youthful amusements, saw many centuries roll away.—The longevity of primeval ages depended much on the uniformity and mildness of the climate, and the purity of the atmosphere. Then there were no changes in the weather to heat and chill the human frame, and to produce diseases to hasten dissolution. Then there were no noxious effluvia arising from alluvion, to generate mala-

dies, and to bear poison and death through the system of man. That there was a sudden change in the seasons, and that it was necessary that the constitution of man should be changed, appears from the Almighty's then granting him animal food.

It appears evident, that the change which was made in the surface of the earth at the time of the deluge, was so great, that had the same mortal eye seen a country before and after the catastrophe, it would not have known that it had been the same. Those who pretend to identify the place where the garden of Eden was situated, seem to rest their arguments on a slender thread. We can form no probable conjecture of the first blissful abode of man, only from the name of the river Euphrates; no other rivers answering the description of those mentioned by the inspired writer; and the present river Euphrates may not be within a thousand miles of the one alluded to in Scripture. That the ark rested on the mountains from which the present Euphrates flows, we have no doubt. Noah and his sons, doubtless had a knowledge of the former Euphrates, and they probably gave the present one the name of the former, believing it to be the same river, or in remembrance of the one on whose banks perhaps they lived. From the present

situation of that part of the world, it would be impossible for any one of the rivers mentioned as flowing from the garden of Eden, to have encompassed the whole land of Ethiopia, if the same country was called Ethiopia then that now is; and the rivers had their rise near the the present Euphrates.

If the ark had rested in Abyssinia, the Nile would have been called the Euphrates, and so of any other river on the face of the earth; and time would have established the error. Moses does not intimate where this river was. But if that is the river to which he alluded, and the Gihon which encompassed the land of Ethiopia, and that Ethiopia is the modern one, this account goes far to support our theory. For a river to encompass that land, there must have been land where now the sea of Arabia and the Indian ocean are, and if so, the formation of their present basins accord with our former views of the formation of the beds of the seas in the old world.

That there was more land and fewer seas on the eastern continent before the flood than since, and that the face of the land was very different from the present, appears equally evident. Then it was more level; most of the deep cavities were made by the torrents of the

flood. The rivers were more in number, but less in magnitude, than the present; for there were no rains which would cause rivers to rise, extend their channels, and force passages to each other.

There were no great alluvial deposits, for there were no streams of sufficient magnitude to make any; and as we believe many of the disorders which agonize and wreck the human frame, arise from the effluvia of putrefying vegetables, the human race were much more healthy than at the present time.

Before the flood, the greater part of the lands were situated in the torrid zone, or as near the situation of the equator at that time, as the tropics now are to our present one. One pole of the earth then was to the west of the centre of North America, in latitude about thirty-eight degrees north, and longitude one hundred and seven degrees west from London. The other was in the great South sea, south-east from the cape of Good Hope, in latitude thirty-eight degrees south and seventy-three degrees east from London; which brought the equator over nearly the centre of Asia, along the mountains of Tartary, across the south-east part of Europe, and south-west section of Africa; that the whole of the then habitable world was in temperate latitudes, and refresh-

ed by the regular breezes which followed the course of the sun.

When the waters were repelled from one side of the globe, and accumulated several miles in height on the other, the centre of gravity in the earth being removed, the poles were suddenly changed in their position, and brought the equinoctial line near to the place in which it is now described. Before the poles of the earth were changed, nearly an equal proportion of land was on each side of the equator; but now more being to the north than to the south of that line, the mountains being further from the centre of the sphere, than the ocean, act as longer levers in the diurnal motions; and though the height of mountains are but small, compared to the semidiameter of the globe, yet their effects in a number of centuries are perceived. They are the cause of the recession of the equinoxes, a change in the points of intersection of the equator and the ecliptic of about fifty seconds in a year. Thus the change of the poles produced a great change of the zones and of the climates on the old continent. Hence the bones of elephants, and trees of tropical growth, which are buried in Siberia and the Frigid zone, now repose in the same soil, on which those animals fed and sported,

shaded by the spreading branches of forests, which now are mouldering with them. And the huge mammoth, shrouded in a mountain of ice, at the mouth of the Lena, received his polished mantle in the same vicinity, where once he basked in the vertical rays of a summer's sun.*

PROOF XXII.

Of the appearance of our Continent.

That our continent is but a youth compared to the other, appears in every object. Long it has, and still continues to be nourished by the dews of the old world, as with milk from the breast of a parent. Here every thing appears in youthful vigour; there are stamped

* It may be suggested, that these remains were transported to the cold regions by the currents of the deluge, as St. Pierre has inferred; but there are a number of weighty objections to these ideas. 1st, If the animals had been transported there from the torrid zone, by the currents of the deluge, they must have been in a less perfect state of preservation, than they are found to be. 2nd, The trees of the growth of warm climates, could not have been transported there by the raging flood, and be so free from injuries as they are found to be; some are found with their roots imbedded in the soil which once supported them, that they must have grown on the soil on which they now rest, or in which they are buried. 3d, If the animals and vegetables had been transported to Siberia, from the torrid zone, they would have been carried by some currents into heaps or masses. No such collections have been discovered in those regions; but they are promiscuously scattered over the north part of Asia, as if an instantaneous calamity had overwhelmed them, when they were reposing in their native forests, and were suddenly buried by the waters and alluvion.

the marks of declining age. Here the streams flow full, pure, and rapid, as circulate the fluids in a healthful youth emerging to manhood; There slow, sluggish, and small, they creep along their once extensive channels, as move corrupted fluids in the parched and shrivelled veins, worn out by age, by folly, and vice. Here in every vale and depression of land, are springs, rills, and brooks, whose banks are adorned with innumerable flowers, loading the breezes with their fragrance, and cooling the air with their exhalations, all combining to variegate and enrich the scene; as in youth when all the pores are in tune, when health and genius glow in every feature, and strength and activity are expressed in every motion. Far otherwise is the appearance in the parent world; there are vast hollows without brooks, and channels without rivers, and barrenness and desolation rest upon their borders; all are as indicative of age and decay, as a body without moisture, or a countenance disfigured by dry and parched wrinkles. Thrifty forests are the splendid tresses of our youthful continent; there barren heaths and sandy deserts show that age and disease must soon overtake all that is mortal. Our cool, moist, and exhilarating breezes are the breath of our youthful and vigorous lands; there,

emblematical of disease and dissolution are the Harmattan, the Sirocc, the Samiel, and Simoom, which carry poison and death in their train.

It may be observed, "That our continent bears many distinguishing marks of antiquity in the remains that are almost daily brought to light." It is true, there are remains of remote antiquity reposing beneath the alluvion, in almost every part of our continent, but the situations of these remains are far different from what they are in the eastern hemisphere. Here they are promiscuously scattered through our plains, mountains, and vallies, as if designed to fertilize our soil. A youth may be surrounded by the works of his ancestors, may feed on the substance which they have collected, and still be in youth or in the vigour of life. Here rich mould which of late has been deposited by currents, covers the remains of antiquity which are so frequently brought to light. There barren sands which have been gathered by scorching winds envelope the remains of ancient grandeur. Cities, once the proud mistresses of mighty empires, surrounded by verdant fields, spicy groves, and luxuriant vallies, are now heaps of ruins, enclosed by deserts which the fell monsters of the wilderness scarcely dare to traverse. The poisonous winds

have blasted the verdure of their fields, annihilated their fertility, and tempests of sand have buried their plains and vallies, gardens, arches, and temples, in lasting ruin. Where are the fertile plains, extensive aqueducts, commodious harbours, and superb edifices of the once proud rival of Rome? Beneath the billowing sand are they to be sought. No verdant lawns, nor blooming vegetation is fanned by the zephyrs, where once was the fertile garden of the world. Nothing but scenes of desolation and ruin are now presented to the eye, where the hum of business, the carols of mirth, or the din of war assailed.

Far different is the soil which covers the monuments of antiquity on our youthful continent. Here waters commissioned by heaven to devastate the old world have brought the fatness of their soil, and deposited it with alluvia on our plains, whose fertility is manifested in the majestic forests, and abundant harvests which are witnessed here.

PROOF XXIII.

Of the unhealthy state of our Continent.

Our continent has been often accused by the inhabitants of the eastern hemisphere, of being more unhealthy than theirs. We do not

deny but many diseases are more prevalent here than in the old world, and the causes when explained, will serve to support our theory. Epidemics, and such diseases as are generated by decaying, or putrefying vegetation, are the diseases, and the only ones which are more prevalent here than on the eastern continent.

Our immense tracts of alluvial countries, in which masses of vegetables are deposited, when divested of the shading forests, and are exposed to the rays of the sun, emit an effluvia, which, when inhaled, engender disease. The most of our alluvial deposits having been made by the flood from the north, several centuries after the general deluge formed the last stratum in Europe, as many centuries must roll away after our wilderness is converted to cultivated fields, as did after the general deluge before our alluvion was formed, prior to our climate's being as free from noxious vapours, as is the climate of the other quarters of the globe.

When we examine attentively, the state of alluvion in our country, and the places and seasons in which epidemics prevail, the positions we have taken will be seen founded in truth. The epidemic is not limited to any climate, but has prevailed at different periods, almost from one extremity of our continent to

the other; but. in or near those places where are most vegetable deposits, it has prevailed more frequently, and has been more destructive. In every part of our country when the forests have been removed, and the soil and vegetable mould has been heated by the summer sun, fevers in various degrees of malignity have prevailed. But, where the lands are high, and have but little alluvia in the vicinity, in a few years they become as healthful as any parts of the world. In some instances cities, or towns which have an elevated situation, and are builded on ground which is not alluvion, have been visited by malignant fevers. In such instances the effluvia arising from vegetable deposits, perhaps at many miles distant, by regular breezes from that quarter, are borne to the elevated situation, inhaled with the atmospheric air, and produce deadly disease. But, in many instances where cities are upon, and surrounded by alluvion, for years they will escape diseases of a malignant nature. If the season is cool, that vegetable remains are not heated below the strata from which the effluvia, or animalculæ of preceding seasons have arisen, no malignant disease prevails. The season may be hot, and if at the period when the secret implements of disease and death are loosened, the current of air is from the city,

the deadly particles are transported to a distance, and if a settlement obstruct their flight, many will mourn their unexpected arrival.

In the southern part of our country, as we have described, where the current from the north was opposed by that which flowed down the Atlantic into the gulf of Mexico, most alluvion is found, and most vegetable remains are mingled with the strata, and in that section of our land, we are to expect that malignant diseases will be most frequent, and will longer prevail. But when our country has as long been exposed to the winds and sun, as have the alluvial districts in Europe, they cannot with propriety say, that our land is more subject to diseases than their own, except in one particular. If our theory is correct, dews and vapours are brought from the old world to the new. If so, the noxious effluvia which rise there, may be borne to our continent, and continue to affect the constitution of our bodies, debilitate and weaken our mortal frames.*

* In many parts of the old world they are subject to diseases which never visited our shores. The winds from the deserts not only prove destructive to man, but brutes and vegetables fall a prey to their fury. On the West India islands, much alluvion was deposited as we have described, and there epidemic diseases prevail more perhaps than in any parts of the world. In South America, except in the north part where alluvion was formed by the last flood, epidemics seldom prevail. In Brazil, and some parts of Peru, the climate is as

PROOF XXIV.

Of the Insects, Vegetation, &c. of America.

It may be thought by some, that it is for the want of more weighty proofs to establish our theory, that we descend to the insects, reptiles, and vegetable tribes, as witnesses to support us in the premises we have taken. But, we consider nothing of little consequence which God has made. His wisdom, power, and goodness are as much displayed in the smallest insect that is wafted on the wings of the wind, as in the towering mountains whose summits are hid beyond the clouds, or in the expanse of the ocean whose waves encompass our sphere. The same Omniscient Being who created, preserves and regulates the shining worlds and systems that range the unlimited fields of ether, and appointed to each its station and use, has exercised Omniscience in creating the smallest plant that grows, or the meanest reptile that moves, and employed the same goodness in appointing to each an office, to promote the happiness of the general whole.

warm as on the coasts of Terra Firma; yet, in the former places, destructive fevers have been scarcely heard of, in the latter they have been frequent. In Terra Firma they are not so frequent and fatal as they were formerly. Admiral Vernon visited these coasts, at a period when most of the secret messengers of death were sent forth, and many of his hapless crew fell victims to their fury.

God has created nothing in vain. The vast chain of creation would be incomplete, were one species of insects, or even of vegetables destroyed.* Inconsistently we complain of the inconveniences we endure from thorns, brambles, noxious weeds, and poisonous insects, and reptiles, and reflect not, that were it not for these, we should be subject to far greater afflictions. We have more insects and vermes than are found in Europe. When we reflect on the offices to be performed by this part of God's creation, we readily perceive, that according to our theory of the formation of countries, more insects and noxious plants are required in America, than in any other quarter of the globe. Here, as has been observed, are

* It will be observed then, that this chain has often been broken, as in the revolutions of nature which have been described, many species have become extinct. But it will be remembered, that all these changes and revolutions have been wrought by the hand of God; and have or will be conducive to the happiness of man. As the revolutions and catastrophes which our planet has experienced have produced changes in the seasons, in temperature of climate, and even in the order and economy of nature, it has been necessary, that the constitutions of man, and of the various species of beings in the animal and vegetable kingdoms be changed. By these revolutions some species, and even genera became useless and were destroyed. Others have been changed, that they may better perform the various duties devolving on them. Such we conceive is the state of man. At the general deluge, such a change was wrought in our planet, and in the elements, that God in his wisdom saw fit to change the constitution of the human race, as well as of the brute creation. That there was such a change, we infer from the word of God. When man was first created by the command of God, fruits and vegetables were to be his only food. These likewise were to be the sustenance of every mov-

more alluvial formations, and of later date than on the eastern continent. Hence, more noxious effluvia arise. These effluvia are of various sizes, shapes, and properties. The design of insects is to devour these poisonous particles which otherwise would render the air unfit for respiration. These particles are poison; hence, the insects become poisonous from the food on which they live. One species of insects is formed by infinite wisdom, and organized for the reception of one kind of effluvia, and one for another. The larger feed on the less, and as the effluvia cease to rise, one generation has performed their office, they expire. Here see the wisdom and goodness of God. One generation of insects deposit their ovia which lie dormant, till the heat of the vernal sun causes fermentation in vegetable matter,

ing thing. But when the waters of the flood subsided, and God blessed Noah and his sons, he said unto them, *Every moving thing that liveth shall be meat for you; even as the green herb have I given you all things.* It is evident, that in changing the diet of man in so essential a manner, it was necessary that his constitution should be changed; and the same of the brute creation, for the food of many species since the delugé, has been animal. From Genesis, chap. viii. ver. 22, we infer that, at that period, a great change was wrought in the seasons. *While the earth remaineth, seed time, and harvest, and cold, and heat, and summer, and winter, and day, and night, shall not cease.* We conceive, that before the deluge there was no change in seasons, as has been described, and no regular *seed time* and *harvest*, for it mattered not when the seed was committed to the faithful bosom of the earth, for before there was no cold nor heat. The cause of these changes has been explained in the change of the poles of the earth.

and the noxious effluvia are sent forth. Then each embryo insect bursts from his secret cell, and millions and millions fill the air, not in vain sport as fancy represents, but in the most active employment in gathering, in conquering, and destroying, the enemies of the peace and happiness of man. When their employment is ended as autumn advances, they rest from their labours. But their frames, though small, having been nourished by poisonous particles, if permitted to decay on the surface of the earth would again envenom the atmosphere. But a Being, perfect in wisdom and goodness, has provided against this inconvenience. When autumn approaches, when effluvia cease to rise, when insects retire from the regions of the air, then myriads and myriads of vermes are sent forth on the surface of the earth to collect and bear to their cells the carcasses of such as have fallen.

In warm climates, where no frosts destroy these vermes, numerous species of reptiles and venomous serpents are placed, and fitted with proper organs to receive the poison which has been collected from the atmosphere. Wherever stagnant waters or sunken marshes abound, innumerable insects fill the air in the summer, unnumbered species of vermes cover the ground in autumn, and frightful serpents

lurk concealed in every bramble. When marshes are drained, forests are removed, the lands cultivated, and the vegetable mould is purified, there is no further employment for these numerous species of beings, their numbers diminish, as their services are less needed.

Noxious weeds and brambles are designed for a similar purpose. All vegetables are so constructed, that they purify the air. The noxious ones receive such impure particles from the atmosphere, as insects were not organized to deposit. Culinary plants receive those of a purer quality, and all of them throw off a fluid which is congenial and exhilarating to animal life.

In rich alluvial formations, we find many more species of vegetables as well as insects; and the newer and richer the soil, the more abundant both will be.*

Then it is advisable that there be more insects, vermes, &c. on our continent than on the eastern; and as it has pleased the Almighty

* Should our cities, which are subject to disorders arising from the effluvia of putrefying vegetation, be diversified with here and there a square, in which various kinds of trees common on alluvial formations, together with thorns, briars, thistles, nettles, and various other noxious weeds, should be suffered to grow unmolested, the numerous species of insects would find a safe retreat in them, and the deathful particles, instead of being incorporated in the human frame, would flow to the reservoirs which the God of nature has formed to receive them.

to give us a most luxuriant soil, we must expect numerous species of insects, and they will continue to abound, till our marshes and forests are no more, and till our alluvial soil by cultivation, is made to discharge the noxious effluvia—then we shall be in want of no purifiers of the air, and then we shall be as free from them as any part of the world.

PROOF XXV.

The Tides.

In introducing a subject like this, the author is aware of the difficulties he has to encounter. In regard to the other phenomena of nature which he has attempted to explain, there is a variety of opinions, if any opinions on the whole of them have been formed. But the phenomenon of the rise and fall of the waters of the ocean, and the various currents which prevail along diverse coasts, has been accounted for by the *illustrious* NEWTON. The opinion of one so deservedly eminent, of one whose name has been elevated to the highest degree in the scale of science, the name or opinion of such a man, though none will deny but the greatest of human kind may embrace some errors, goes far, very far, to incline the minds of a community to a prejudice against

innovations. No man has read the works of the *immortal* NEWTON with more pleasure and edification than the author. None has a more exalted opinion of his talents, pays more respect to his memory, or is in more admiration in contemplating the blessings which his unlimited mind brought to the scientific world. Yet perfection is not to be found in man. The greatest that ever lived, cannot but say he had embraced some errors.

The brilliant rays and sublime effulgence of Sir Isaac Newton's genius, may have dazzled the eyes of many, that beneath the splendid beams of his talents defects or errors may lie unseen.

It is the opinion of the author, that a mind in pursuit of truth, should not receive as infallible the ideas of any man, unless accompanied by complete demonstrations. Great men may have great errors.

The constant dropping of water will wear away the hardest rock; mountains, by industry and perseverance may be removed; but more difficult is the task to remove an error founded by a great man, and fixed by the prejudice of ages. But there is more merit in striving alone against the torrent of error, than in gliding quietly with a multitude down the stream to the stagnant waters of oblivion.

The cause of the tides having perplexed and agitated the minds of the ancient philosophers, and having for centuries been ranked among the mysteries beyond the bounds of human comprehension, serves to bias the mind against receiving an explanation which is plain and simple.

In every age of the world, new discoveries have been made. One discovery or invention leads to another, and the steps of science are so wisely constructed, that every succeeding one is more easily ascended.

Had the ancient sages and philosophers possessed such a knowledge of the surface of our planet, of the oceans and continents, seas and islands, as the moderns have, they would not have laboured so much in vain to demonstrate the ebbing and flowing of the ocean. And it is believed, that had Sir ISAAC NEWTON been possessed of facts which have been brought to light since the world was honoured by his presence, that he would never have laboured to establish and support a theory, loaded with such inconsistencies as his is, of the tides, and which is almost universally adopted.

Many of mankind prefer adopting without examination theories of great men, to taking the labour of investigating them. Sir ISAAC NEWTON was a great man. He made many

and great discoveries. He corrected many great errors of great men, who had shone as stars of the first magnitude in the firmament above, before the world was favoured with his presence. But, though the sun which enlightens our sphere, and emits light and heat to the numerous and magnificent worlds that revolve around him is a glorious brilliant orb, for all wise purposes, he is not wholly luminous. Though the splendor of his rays so dazzles our eyes that he appears a perfect sphere of light, yet on more acute examination, there are opaque spots on his surface.

The author believes, that human nature is not only liable to depart from truth, but is inclined to error; and believing Sir Isaac Newton to be in an error in regard to his theory of the tides, he considers it a duty which he owes to his fellow creatures, to make known his objections to that theory, and explain another which appears to him to be more simple, more consistent with the principles of philosophy, and far more coincident with the immutable laws of the God of nature.

We will endeavour, first, to examine briefly Sir Isaac Newton's theory of the tides.

After we have reconnoitred the works he has erected, and prejudice has fortified, we will see if we have force to destroy the forti-

fications; and then endeavour to build a castle, on a foundation firm as reason, unshaken as true philosophy, and durable as the laws of nature.

Sir Isaac Newton's Theory of the Tides.

In taking a view of the theory of the tides, founded by this great man, it is necessary to refer the mind of the reader to the system of worlds of which our globe makes but a small part.

The sun is the centre of our system. Eleven spheres resembling the earth, some greater and some less than our planet, revolve around the sun in periods of time proportionable to their distance from the sun. Five of these worlds had not been discovered when Sir Isaac Newton lived. Eighteen other spheres, resembling the earth in shape and matter, but less in magnitude, belong to the solar system. These are denominated moons, secondary planets, or satellites, and in their revolutions round the sun as a common centre, they pass the orbits of the respective primary planets which they are destined to attend.

The earth has one moon, or attendant secondary planet; Jupiter four; Saturn seven; and Herschel six. No secondary planets have

been discovered accompanying the other seven primary planets.

The earth is nearly eight thousand miles in diameter, and performs its course round the sun, at the mean distance of ninety-five millions of miles from the sun.

The moon is little more than two thousand miles in diameter, and accompanies the earth round the sun at the mean distance of two hundred and forty thousand miles from the earth.

Admitting the earth to be eight thousand miles in diameter, it contains five hundred and twelve thousand millions of cubic miles; and allowing the moon to be two thousand two hundred miles in diameter, which is nearly its size, that orb contains ten thousand six hundred and forty-eight millions of cubic miles, making the earth nearly fifty times as large as the moon, or containing nearly fifty times as many cubic miles of matter as the moon does.

It is the opinion of the greatest philosophers, that not only the moon, but all the bodies composing the solar system, are formed of matter similar to that of the earth, and are the habitations of intelligent beings. To account for the phenomena of the motions and appearances of the heavenly bodies, they admit that they are all attracted by the sun in proportion to

the quantity of matter they contain, and their distances from the sun. They also attract each other in the same ratio. This is doubtless the case, for in no other manner can we account for the various appearances of the planets.*

Sir Isaac Newton, and a greater philosopher never lived on earth, supposed, and attempted to prove; that the waters of the ocean, and of

* Here we trust we shall be excused for giving our opinion in some points of astronomy, which it is believed have not been suggested by philosophers. The sun is the centre of our system; it has been discovered that it has a motion on its axis, and being attracted by the planets, revolves in an orbit the diameter of which is less than the sun's diameter.

We believe that the sun is performing a revolution in an extensive orbit, that the primary planets revolve round the sun not in circles, but in the same manner as the secondary planets revolve round the primaries. The centre of our system may move thousands of miles in an hour, and we not perceive the motion, the sun being the great centre to which our attention is fixed. It does not appear consistent with reason and philosophy, to suppose that a body so large as the sun should have a rotary motion, and remain in or near the same place. All of the fixed stars are suns and centres to other systems. Numerous worlds, the abodes of intelligence, surround each of these shining spheres, which, like our sun, are all performing courses round some common or universal centre. The suns, as well as planets, are the residence of the creatures of God, all experiencing his munificence. God is unlimited in his power, and space which is adorned by worlds and shining spheres, is as extensive as the power and goodness of God. The stars or suns which once appeared in the heavens, and were noted by the ancient astronomers, and have now vanished from our natural eyes, and from optical vision, were performing their tours in a different direction from our sun; and those which now emit their brilliant beams to earth, and shone not on ancient ken, have, in the vast machinery of creation, been approaching our system. *The heavens declare the glory of God; and the firmament show forth his handy works.*

various bays, were made to rise by the influence of the moon's attracting the earth; or that the waters were raised, and the various currents of the ocean produced by the attraction of the sun and moon. The moon being sixty-four million seven hundred and sixty thousand miles nearer to the earth than the sun, would have more effect on the waters of our planet than the sun, though the latter is several millions of times greater than the former.

These phenomena he explains with a degree of ingenuity, peculiar to so noble a mind. The attraction of the moon on the waters, on account of its being so much nearer to the earth, he says is in proportion to that of the sun as five to one. That as the moon raises the waters five feet, the sun raises them one. The tides are higher at some times than others.— They are highest at new and full moon, and lowest at first and last quarters.

“This,” says the immortal Newton, “is occasioned by the influence of the sun and moon operating upon the waters in the same line of direction.

“At the time of new moon, the sun and moon being on the same side of the earth, both attract the waters of the earth on the side towards them in the same direction, that on that side the waters rise to their greatest height.

On the opposite side of the earth, there is a high tide at the same time." This, as the great philosopher says, "is owing to the same cause;" viz. The sun and moon attracting, for instance, on the west side of the earth, cause the waters to flow in that direction from, what for perspicuity we will call, the upper and lower sides of the earth. The waters on three sides of the earth being attracted to one side, to the west, causes the centre of gravity in the earth to be moved to the west; hence the waters on the opposite side, the east side of the earth being further from the centre of gravity, are drawn in a less degree towards the earth, or are inclined to flow in an opposite direction, and accumulate on the east side.— Hence there is a high tide on the east and west sides of the earth at the same time, while on the upper and lower sides, the waters are low, on account of their having flowed to the east and west.

When the moon arrives at first quarter, suppose above the earth, the sun is west of it; then the sun and moon attracting in quadrature, serve to bind the waters on the surface of the earth; hence there would be low or neap tides, the same at the time of the last quarter of the moon; but at full moon, or when the sun is on one side of the earth, and the moon on the

other, then high or spring tides are occasioned, says Newton, in the following manner.

The moon attracting the waters to the east, raise them on the east of the earth, and those on the west, being inclined to flow to the west, are accelerated in that direction by the attraction of the sun; hence we have a high tide on the opposite sides of the globe at new and full moon.

In many bays of the ocean, the tides are much higher than in the ocean itself. This, the great philosopher says, is owing to the water of the ocean being pressed into them, and contracted into a narrower channel as they are driven up the bays, and are found to rise higher towards the heads of the bays.

In seas and lakes there are no tides. This, the same great man says, is on account of their small dimensions; that every part of the surface of such small bodies of water, being so nearly equi-distant from the sun, or moon, that every part is equally attracted, and one part cannot be raised above another.

In some parts of the ocean, the currents of the tides flow in various directions. This, he says, is produced by the situation of the coasts.

These are the principal heads in the New-

tonian theory of the tides, and our limits permit us not to notice more.

Though we conceive that the premises and conclusions are erroneous, none can but admire a genius so adroit, as will make false premises appear so plausible, and then draw conclusions so completely coinciding with them.

We will first attempt to prove, that the premises assumed by Sir Isaac Newton, in his theory of the tides, are not correct.

1st. He says that the moon, by attracting the earth or the waters on its surface, causes the tides.

He has proved, that the force of attraction in two or more bodies, is in proportion to the quantity of matter in the bodies, and their distances from each other. The moon being much nearer to the earth than the sun is, attracts the waters more than the sun. If the moon attracts the earth more than the sun does, as it must if it raises the waters higher, the earth would revolve round the moon as a centre; but the earth, in its whole revolution, does not incline towards the moon. This Sir Isaac Newton himself has clearly explained. The earth does not attract the moon so much as the sun does, because in no part of its orbit does the moon move from the sun. If the earth attracted the moon more than that body is attracted

by the sun, at new moon, or when the earth is on one side of the moon, and the sun on the other, the orbit of the moon would incline towards the earth, which is not the case.

If bodies attract each other in proportion to their distances and quantity of matter, the earth being nearly fifty times larger than the moon, would attract the waters on its own surface more than the moon attracts, when that comparatively small body is two hundred and forty thousand miles distant. If the earth attracts the waters more than the moon attracts them, they would not rise or depart from the centre of gravity in the earth. If the moon attracts the waters more than the earth does, they would flow to the moon with a motion constantly accelerating as that of a body descending to the earth.

If the moon has force of attraction to raise the waters ten feet, they are further from the centre of attraction in the earth, and that in the moon is nearer; hence it would require less force to raise them the next ten feet, and the attraction of the moon being greater upon them because they are nearer; hence, all our waters would go to the moon.

If the moon raises the waters on the surface of the earth by attraction; the waters on the earth's surface nearest to the moon would be

raised the highest. When the moon is perpendicular to the equator, the waters of the ocean on the equator are more than seven thousand miles nearer to the moon than the waters at the poles of the earth; yet the waters near the equator do not rise so high as towards the poles. When on the equator, the tides rise but two or three feet, in high latitudes they rise from twenty to sixty feet. If the attraction of the moon causes the waters to rise, on several accounts, they would rise higher on the equator than in any other parts of the oceans. The projectile force on the equator is greater than towards the poles that the waters would be easier raised. The diameter of the earth from east to west is greater than from north to south, that the surface of the globe on the equator is further from the centre of gravity than the poles, that a body of matter on the equator, though it contains the same quantity, is lighter than the same body would be towards the poles. The extent of the oceans on the equator is greater than towards the north pole, that a greater quantity of waters would be affected by attraction, they would be drawn further and rise higher than in the narrow parts of the ocean to the north, yet they rise but little on the equator. The regular trade winds on the equator would assist the

moon in raising the waters if she discovered the least disposition to deprive our centre of gravity of its balance or power. The trade winds blow from east to west, and incline the waters in the same direction. The earth turning from west to east, that the moon comes to the meridian on the east coast of an ocean or continent, before it does to the west, that the current of the ocean would be uniformly to the west.

Hence, when the moon reached the meridian over the east coast of either continent, the whole current of the ocean on the east of such a coast would be arrested there, and there would be the highest tides; but the reverse is true.

In most lakes, and in such seas as have no communication with the ocean, or if but small straits connect the ocean to them, there is no tides. This is explained on account of their small extent. But in some lakes much less than these seas and lakes which have no tides, the waters rise and fall as regular as in the ocean. In the Caspian, Black, and Baltic seas, and in various other extensive beds of water, there are no tides; yet in bays not a tenth part so extensive, the waters are raised to a great height. But this it is said, is owing to the water's pressing into the bays from the ocean,

But the waters begin to rise in the bays before they do in the ocean communicating with them, and first flow from the bays to the ocean.

The surfaces of the above mentioned seas are so small, that the moon considers them unworthy of her notice, and leaves them unagitated by her charms. Yet the bright queen of night condescends to look into many springs and wells, but a few feet in diameter, and by her mysterious smiles or frowns, causes the waters to rush from their secret retreats, and to rise as high as in the greatest ocean.

In some parts of the oceans, the partial goddess by her magic arts, agitates the briny waves but once in twenty-four hours. In other places the waves scarcely have rest from the influence of her mystic wand. Even when the merciless empress of the waters is vertical to their antipodes, the waves are not suffered to repose. Some of her secret agents rouse them from their slumbers, and cause them, surge propelling surge, to attack the sturdy shores.*

* It is a prevailing opinion among a large class of the community, that this miraculous being, which appears as pleasant in the night as errors do to minds in the darkness of ignorance, that the being which loses her splendour when the god of day smiles on a hemisphere, as ghosts retire at his approach, or as superstition recedes from the beams of science, it is the opinion of many, that this being has supreme command of the vegetable kingdoms, as well as of the ocean. She is consulted as to the time most proper for the husbandman to sow his fields, as likewise when he shall gather the fruits of his industry. They believe, that if she is not particularly consulted, and he

But the arctic regions are most affected by her imperial sway. The waters near either pole seem her favourites, and are ambitious to serve her, against those which dwell in the equatorial regions. The former rise at her appearance, and rush towards the latter as if to overwhelm them for their negligence or stupidity, but as they roll to warmer regions, their enthusiasm diminishes, and in perfect harmony they unite under the laws which govern the torrid climes; and again recede to their respective zones.

Some have endeavoured to explain the cause of the waters rising higher towards the poles, from the following premises:

times particularly regarded, she will blast the grain that they commit to the faithful bosom of the earth, or cause it to mould or rot when gathered in the store house.

It is presumed, that this superstition is not wholly without foundation, and it is presumed that it took its rise from the following facts. The tides are highest at new and full moon, the cause of which will be explained without assigning omnipotence to empress LUNA. In many parts of Holland, the cultivated country is actually below the surface of the ocean at high tides. Such lands are defended against the waves by strong dykes or banks. At high tides, it is rational to suppose that these lands would be affected. The farmers noticed it, and mistaking the cause, assigned to the moon the effects of the ocean. The industrious Hollanders have migrated to almost every nation on the globe. If the lands they cultivate, are thousands of feet above the highest tides, they observe the same signs and seasons, as did their ancestors, who faithfully toiled below the waves. Marvellous ideas are most delightful to many minds. Those of the Hollanders have been embraced by many of various climes and languages, and the moon is indebted more to them for her power than to the Being who made it.

They say, "When the moon is over or near the equator, the waters in high latitudes are attracted directly towards the moon, and the waters are raised higher, because they move in a more horizontal direction; and subside as they come more directly under the moon, which has not power to raise them perpendicularly.

If this position was correct, the waters would be attracted from east and west in the same manner as from north to south, and at ninety degrees from a point directly under the moon, the waters would be as much affected as at the poles. But the reply is made, "That the continents prevent this attraction from extending so far to the east and west, as to the north and south." But the Pacific and Indian oceans extend two hundred and thirty degrees; fifty degrees more than half the circumference of the globe. This vast expanse of ocean would be as liable to be attracted from east and west, as the Atlantic or Pacific is from north to south.

A further objection may be made. "The fluids being colder towards the poles, press towards the equator where they are warm and lighter."

But observations and facts have shown, that the current of the atmosphere is from east to west, and that it presses the waters in the same direction.

If the tides are produced by the attraction of the moon, it is evident that on account of the situation of the continents, that the waters would be accumulated in some places much more than in others, as in extensive bays or gulfs opening into large oceans. This the Newtonian philosophers confess, and from this they attempt to explain the cause of there being such high tides in the bay of Fundy, in Bristol channel, on the coasts of Malaya, at the mouth of the St. Lawrence, along the coast of China and Japan, in the sea of Bengal, and various other places.

The bay of Fundy opens into the Atlantic ocean to the south-west. If the general pressure of the fluids is from the poles to the equator, the waters by this pressure would not be driven into the bay of Fundy; for there is no obstruction to their passage to the south till they reach South America. If the water subsided as it came to warmer regions, or more directly under the moon, they would not have flowed back to the north with such violence as to heap up the waters in that bay to the height of sixty feet.

In the gulf of St. Lawrence the tides are high. That gulf opens to the ocean to the east and north-east, and the island of Newfoundland being situated directly opposite the

mouth of the gulf, that the straits to it are so narrow, that in six hours the waters of the ocean could not press through the channels so as to raise the gulf so high as they appear.

Bristol channel opens to the west, and the waters of the ocean must flow with great violence to every point of the compass, to fill the bays and channels we have mentioned.

To the east of Africa is a much greater extent of ocean than to the east of Asia, yet on the coasts of the former the tides are not so high as those on the latter. The sea of Arabia opens into the Indian ocean with a much wider mouth than the sea of Bengal. Yet in the sea of Bengal, the tides are higher than in the sea of Arabia.

If the tides are raised by the attraction of the moon, and the waters of certain bays are raised so much higher than the ocean by being forced into basins narrowing towards their head; why are not all bays which are situated in a similar manner affected as much. Pamlico and Albermarle sounds open into the Atlantic by wider channels than the gulf of St. Lawrence, and the former are not so large bays as the latter that the waters would be more compressed in them than in that of the St. Lawrence; yet in Pamlico and Albermarle

sounds the tides rise but four or five feet, and in the St. Lawrence they are raised forty.

The bay of Fundy opens into the same ocean and has a similar situation to the Delaware, yet the tides in the former are six times as high as in the latter. The same difference is observable in numerous places.

If the moon raises the waters by attraction, there is no bay or branch of the ocean so favourably situated for an immense accumulation of the waters as the arm of the Atlantic which lies between North and South America. From cape Sable in North America to cape St. Roque in South America, a distance of nearly four thousand miles, the coasts are situated to bring the waters of the Atlantic to a point in the Caribbean sea and in the gulf of Mexico. Yet there the tides are not high. It will be observed, that the West India islands prevent the waters of the ocean from flowing in to fill the sea and gulf. If the waters of the ocean were obstructed by the islands they would be accumulated on the east side of them; but the waters are elevated there only a few feet; besides, there are more than twenty channels between the island to the interior basins, much wider and deeper than either of the two which unite the gulf of St. Lawrence to the Atlantic ocean.

If the moon is the principal cause of the tides, or if the sun and moon, and all the heavenly bodies combined raise the waters on the earth by attraction, there must be some more essential local causes to produce the effects which are witnessed.

The sun and moon are so remote from the earth, that in comparison to their distance, the earth is but a point. Then all parts of the earth would be nearly equally affected by their influence, if affected at all by the law of attraction.

From these remarks we are led to conclude,

First. That the moon is so small a body, and so remote from the earth, that it appears inconsistent to suppose that it would have so much influence on the earth, as to raise and agitate the waters to such a degree as they are known to be affected.

Second. Admitting the possibility that the sun and moon, by attraction, do raise the waters, they would be raised and flow in different directions from what we see they do.

Third. If a possibility of the sun and moon's raising the ocean existed, the tide would be highest, where now they are lowest, and lowest where now they are raised to the greatest height.

With these conclusions, we will attempt to find some local causes, which, united with the influence of the sun and moon, are the principal agents that produce the various phenomena of the ocean.

Explanation of the cause of the Tides.

The atmosphere, as we have observed, is a fluid encompassing the earth, extending to the height of nearly forty-five miles from the earth's surface. This fluid presses, or is attracted towards the centre of the earth, with a weight equal to thirty-three solid feet of water. Or, the weight of the atmosphere on the surface of the land and water, is the same as would be the pressure, if on each part of the surface of the globe rested a column of water thirty-three feet in height. This is the common pressure of the air on plains and on the ocean, seas, lakes, &c. On mountains the pressure is not so great, in vallies it is greater. The atmosphere does not press at all times with equal force on the surface of the earth.

1st. When the winds blow, it does not press so heavy as in an entire calm.

We suppose, for instance, a column of atmosphere, one foot in diameter, to be equal in weight to a pillar of wood of the same diame-

ter, one hundred feet long. That pillar stands perpendicularly on the surface of the earth. The weight of that pillar on the earth is as the pressure of the atmosphere on one square foot. If a force be applied to that pillar in a horizontal direction, it will not press so heavy on the surface, and the pressure towards the centre of the earth, diminishes as the horizontal force increases. The same fact may be elucidated by a mill-stone, which, when in rapid motion, can be raised with less force than when at rest. And when the horizontal motion is so increased, that the projectile force is greater than the attraction of cohesion, the stone breaks. The pieces do not fall directly to the ground, but move in a horizontal direction.

This position is easily demonstrated by experiment. Balance a pair of scales with a top in one side. Then put the top to whirling in the scale with the same weights in the other, and the scale will not be balanced till the top ceases to move. A ball on a horizontal plane, when struck horizontally, in its motion presses not on that plane so much as when at rest; and with the greater force it is struck, the less it presses on the plane.

A running stream presses not so hard on its bottom, as a still pond of the same depth of water.

On the same principles, the atmosphere, when in a horizontal motion, presses not so heavy on the surface of the earth; and as the motion increases, the pressure decreases. Witness a whirlwind. There the atmosphere receives a horizontal impulse. By the pressure of the surrounding atmosphere, the motion is increased, till the atmosphere not only ceases to press on the earth, but rises from the surface; and not only does the atmosphere rise, but it raises many particles or bodies from the earth with it.

2d. When the atmosphere is heated, it does not press so heavy on the surface of the earth as when cold.

When the atmosphere is becoming warm, it presses less when at the same degree of temperature, than when it is becoming cold.

When there is sufficient heat to cause vapours to rise, each ascending particle gives an impulse upwards to the particles which oppose its rise. When the atmosphere is cooling, and particle unites to particle and descends, the same impulse is given downwards as was upwards when the vapour was rising.

With these two general propositions, combining in their effects, and with several local causes, which we trust will be proved to exist, we will attempt to explain the phenomena of

the tides, and the various currents of the ocean.

In attempting to explain the cause whose effects were the appearance of *dry land*, we endeavoured to show, that beneath the continents, and such islands as have been raised from the ocean,* are vast caverns, or cavities, equal in extent to the matter which was elevated. We suppose that these cavities, or most of them are filled with water as high as the common level of the oceans. Most of them have vast openings into the oceans, through which the waters flowed after the lands were raised, and when the waters of the ocean receded. These openings were formed by the fragments of broken rocks, which support the elevated lands, not filling the numerous rents which were made in the various strata which were broken in their ascension, and the fissures which were open in the strata, which were not elevated, and which support the arches on which most lands now rest. These communications between the oceans, which enjoy the light of heaven and the subterranean seas, are

* It will be remembered, that it has been stated, that many small islands, which appear in the different oceans, owe their existence to the coral. They are readily distinguished from those which were raised by fire. The former have no mountains or hills resting on primitive rocks.

deep beneath the surface of the waters, even to the bottom of the oceans.

The cavities under the lands being filled with water no higher than the usual height of the oceans, have the remainder of the caverns filled with various gasses. These gasses since they were bound to their present limits, have been employed as active agents in producing the tides.

For perspicuity, we will compare the subterranean waters, and those on the surface of the globe, to a pair of scales, the communication between them being the beam. As waters form a level, these scales would be completely balanced, were it not that the exterior atmosphere varied in degrees of pressure on the exterior waters.

When the atmosphere presses most on the ocean, then the exterior scale preponderates, and we have low tides, and then the interior is raised by the waters being pressed into the cavities. When the atmosphere is rarefied that it presses lighter on the ocean, then the interior scale is depressed, the waters are driven from the subterraneous caverns, the ocean is raised, and we have high tides. The tides are high or low, in proportion to the condensation or rarefaction of the atmosphere over the interior and exterior seas, and in propor-

tion to the extent of the waters to be raised or depressed. As these waters are alternately flowing through channels which run in different directions, they produce the numerous marine currents which prevail on the surface of our sphere.

When we have examined the causes which vary the degrees of atmospheric pressure, we will compare the phenomena of the ocean with the effects which would be produced according to our theory.

The causes which produce changes in the degrees of pressure of the atmosphere.

The causes which most affect the atmosphere, are light and heat. We believe that these two causes produce all the phenomena of the atmosphere, and that heat is but an attendant of light, or an effect of which the former is the cause.

Light is matter emitted from the sun, or other luminous bodies, and flows with inconceivable velocity in a direct line when moving in the same medium. But when it passes from one medium to another, it turns from a strait course, and when it strikes a denser medium, except on a surface at right angles, it inclines to a perpendicular to the surface.

Light passes from the sun to the earth in eight minutes. When light is obstructed by an opaque body, the rays are reflected, having the angle of reflection equal to the angle of incidence. Rays of light emitted from the sun reach the moon, and are reflected to the earth; in like manner we receive them from the other spheres which compose our system. Reflected light produces no perceptible heat. The light reflected from the moon affects our atmosphere in a small degree, perhaps compared with that of the sun in proportion to its quantity. The effect of this light is the only effect which the moon has on our waters. The reflected light of the moon sometimes coincides in its effects with that of the sun, and sometimes serves directly to counteract the influence of the direct rays of the sun.

When the rays of light pierce the atmosphere perpendicularly to the surface of the earth at any place, the atmosphere is lightened in that place by becoming warmer, according to our second proposition. But when it pierces the atmosphere at right angles to a line drawn perpendicular to any place, the force with which the rays move, lessens the pressure of the atmosphere over that place, according to our first proposition. Light flowing through the atmosphere in the last mentioned direction,

lessens its pressure more than in the former, and its influence diminishes, as its direction varies from a horizontal to a perpendicular direction. The effects of the light of the moon are similar, though their influence is less.

When the light of the sun and moon pierce the atmosphere at right angles to each other, the rays counteract the force of each other, that the atmosphere is less affected. For instance, at first and last quarters of the moon. We suppose the sun is in the west, the moon has performed one quarter of her revolution and is at the meridian. The rays of light from the sun pass the atmosphere to the east over the Atlantic ocean, and lessen the pressure of the atmosphere there. The rays from the moon come from the south or from the meridian and striking perpendicularly on the rays of the sun, lessen their force without warming the atmosphere, and in a degree destroy the effects of the rays from the sun on the columns of the atmosphere.

If a stream of water from the north moved with sufficient velocity to bear away an obstruction, and just before it reached the object a stream of one-eighth part of the force should rush into the former from the west, one-sixteenth part of the force from the north would

be destroyed, and the obstruction would not be removed.

The rays of light from the sun, and moon thus counteracting each other at first and last quarters of the moon, not so much lighten the atmosphere at those particular times, that the pressure on the waters is great, the unrarefied air over the subterranean waters has not force to press so much of the hidden waters from their cells as to give a spring tide to the Atlantic. Hence, at first and last quarters of the moon neap or low tides are witnessed.

At new moon the streams of light of the two orbs are not opposed to each other. The dark side of the moon is then towards the earth, that no light is reflected from it to our sphere. The light of the sun flows through the atmosphere of the earth unmolested, that fluid is rendered lighter by being rarefied and by the repelling torrent of light. Ocean feels relieved from his burden and presses not so forcibly on the pent up fluids. They struggle for liberty, and rushing from the gloomy caverns, roll their proud waves in the light of heaven. Thence is formed a high tide, by our two propositions.

As the moon advances in her orbit, and the light is reflected to the earth each succeeding day in a less oblique direction to the rays of the sun, each flow of the waters diminish till

the moon comes in quadrature, as has been explained and then the tides are at their lowest flow. After the moon has passed her quadrature, and her light falls more and more oblique on that of the sun, the tides increase in height in the same ratio, and from the same cause they decreased when she was advancing to her quadrature.

When the moon arrives at her full, or in opposition to the sun, then she sends forth most light to the earth, and the rays flowing in a line of direction with those of the sun, the light from both luminaries serve to break the force of the pressure of the atmosphere on the waters, and then again the scale, secluded from the light of day, preponderates, and the towering ocean invades his highest bounds. In this spring tide the principles of both propositions affect the atmosphere.

The query will next arise, "Why the waters are raised higher towards the poles, than on or near the equator?"

From the inclination of the axis of the earth, the ecliptic cuts the equator at angles of twenty-three degrees, twenty-eight minutes; that the sun is never vertical to any places more remote from the equator on either side than that distance; hence, in high latitudes the currents of light pierce the atmosphere in a

more horizontal direction. At the poles, when the sun is over the equator, the rays of light pass the poles in a line perpendicular to the axis of the earth, and, unobstructed, flow through the whole section of the air which covers the frigid zones. Hence the pressure of the atmosphere at both poles is lessened, and the chilled currents roll towards the equator.

As the sun inclines to the north, and spreads his splendid beams wide around the frigid zone, and leaves the southern pole involved in frost and darkness, then the waters in Antarctic regions scarcely move their sluggish waves. While to the north, so long as the sun is approaching the tropic of Cancer, the waters continue to increase in height at every flow. But as he begins to recede from northern regions, to pay his annual visits to southern climes, then the arctic waters, as if dreading the frosts and chilling blasts of winter, begin to retire to the frost secluded caverns. The southern waves then begin to triumph; and sport their summer month away.

The waters in the northern regions rise to a greater height in summer, than those of the south in their benign seasons.

To the north there is more land than to the south; that when the subterranean seas discharge their stores, the liberated torrent

rise in mountainous heights.—While to the south, the vast expanse of ocean is less affected by the scanty currents that are sent forth from the scattering lands.

Having briefly sketched the effects which light and heat have on the atmosphere, and drawn some conclusions as they affect the tides and currents of the ocean, we will more particularly notice the effects which such causes as we have named would have on the waters, and compare them with effects which are known to exist.

1st. If the flowing of the tides are produced by the waters of subterranean seas being forced from their caverns, and the ebbing occasioned by their receding again to their dismal cells, the waters would first begin to rise, and rise the highest near the lands from beneath which the waters rushed; and near such coasts the tides would first begin to ebb.*

That the tides are higher near coasts than at a distance from land, is a well known fact, related by the ablest navigators.

2d. If the tides are produced by the above mentioned cause, the waters would rise higher

* The waters would begin to ebb first at the shore, or near the channel which unites the interior and exterior waters. But as the current of waters, when ebbing, would be towards the shore, by an accumulation of waters against the shores, there they would be last in reaching their lowest state.

near the coasts of extensive and highly elevated lands, than by the shores of small islands; because, under extensive lands, there are large seas to throw forth their waters to the light of day, and more confined air to drive the waters from their secret retreats.

In the Atlantic ocean, between North America and Europe, where the eastern and western continents are of the greatest width, the tides are higher than in any other open ocean. In the Pacific ocean, where the greatest width of Asia is on the west, and the most extensive part of North America is on the east, the waters rise higher than in any other part of the Pacific ocean; and they decrease in height in proportion to the distance from either continent to the middle of the ocean. On the coasts of China and Tartary, they rise to a great height. At isle Necker, Wakes, and Sandwich isles, the rise of the waters are scarcely perceptible. On the west coast of North America, the tide rises in some places twenty feet; while at the islands remote from the continent, two feet is considered as a very high tide.

3d. If our premises are correct, the narrower the channel between two lands, from beneath which the waters are propelled, the higher the waters would be raised in that channel.

Hence, the highest tides are in such situations as the bay of Fundy, the gulf of St. Lawrence, the Bristol channel, straits of Malacca, the gulf of Siam, the sea of Bengal; and in many other straits, bays and gulfs.

4th. If the cause of the phenomena of the ocean is such as we have supposed, there will be no tides in lakes, seas, or bays, between which, and the subterranean seas and bays, there is no communication.

Hence there are no tides in most of the lakes, and in a number of seas and bays. The basins of these do not extend so deep, or have no communication to the vast caverns filled with waters, impatient to come to light.

The beds of most of these lakes, bays, and seas, were formed, as we have stated, by the currents of the general deluge, and other subsequent floods. The openings between them and the interior waters, have been closed by the subsidence of lands, or by alluvial formations.

The basins of the Baltic, Caspian, Black, and Aral seas, were formed by the currents pouring over the mountains to the west of them, and are only excavated in the crust of the earth, or in that part which was first raised from the bed of the deep. Their basins may have had communications with the inte-

rior caverns, and these passages be filled by the subsidence of some parts of the adjoining strata, or by alluvion deposited by the returning waves of the deluge. In the Mediterranean sea the tides rise a few feet. That sea has some communications with the caverns under Europe, or Africa, or both, from which sufficient waters are projected to produce the few and small currents which agitate the waters, and cause them to rise in a small degree. The famous vortex of Scylla is one of these communications, and opening its devouring jaws nearer the surface of the waters than others, the agitation and whirlings of the waves have, from remote antiquity, filled the minds of mariners with horror and consternation, and the inquiring minds with wonder and amazement.

In the Red sea the tides are higher than in the Mediterranean, though its extent is not a quarter so great. It will be said that it rises higher on account of its having a greater communication with the Indian ocean, than the Mediterranean has with the Atlantic. But that the waters in the Red sea, or of the north part of it, cannot be raised by the waters pressing in from the Indian ocean, will appear evident on examination. From the Indian ocean to the north end of the Red sea, is one thousand four hundred miles. To raise the

waters at the extreme part of that sea, the waters must flow the above distance in six hours, making the motion of the waters two hundred and thirty-one miles an hour, or about four miles a minute, which gives a velocity to water, that never was witnessed when it moves in a horizontal direction.

Though the basin of the Red sea was formed by the current which rushed over the Lybian mountains during the deluge, yet there may be communications between that sea and subterranean caverns. Indeed the bed of the sea bears strong marks of this. On the east side the waters are shallow, on the west the coast is precipitate, and the waters are deep. When that sea rises, the waters do not rush from the straits of Babelmandel in a current, but rise as, near all coasts in a perpendicular direction, filled with bubbles, which are the gasses which press from their retreats the interior waves.

The North and Irish seas were formerly by currents. They have such direct communication with the Atlantic by such wide mouths or channels, that they may be raised by the waters of the ocean, and from interior floods.

Along the coasts of the United States, the tides are not so high as they are in Europe in the same latitude. If the moon raises the wa-

ters by attraction, this must be an unfathomable mystery. But if our theory is correct, we can solve the cause without recourse to magic, and without plunging into the arcana of nature, or labyrinths of mystery.

Most of the United States bordering on the coast of the Atlantic, is alluvion. Most of this alluvion rests on what was once the bottom of the ocean, and which was not elevated so high, if elevated at all, as to leave large openings between the ocean and the caverns from whence our mountains arose. Hence the communications between the interior and exterior waters, are so small, that the waters from within are not pressed out in such profusion as to cause our waters to rise to so great a height, as where there are less alluvial deposits along the coasts.

Hence we have a cause for the tides not rising so high in Pamlico and Albermarle sounds, as in the bay of Fundy, and the gulf of St. Lawrence. The former were preserved by the rivers from alluvial deposits which surround them. The latter are without alluvion, near them; that the channels between them and the subterranean waters are unobstructed.—The former receive no accumulation of waters but what is brought to them by the ocean; the latter receive the waters of the ocean, and a

far greater abundance from interior regions. Hence the waters in the former rise but four or five feet, while in the latter they are elevated from forty to sixty. Hence we have a cause for the tides flowing with foaming violence up many of the rivers in Europe, while, with but a steady current, they oppose the largest rivers in the United States.

If the moon raises and agitates the waters of the Indian ocean, to such a degree as to cause them to retreat at the rate of two hundred and thirty miles an hour into the Red sea after winding their course through the straits of of Babelmandel, we would inquire, if it is not a mystery, why the waters of the Atlantic, in the same latitude, are not put in sufficient motion to flow through the numerous direct channels between the West India islands and fill the Caribbean sea and the gulf of Mexico?— According to the adopted theory, the cause is a mystery beyond the thoughts of mortals to fathom. But from the premises we have assumed, the cause appears plain and simple.

If we were correct in our conjectures, that the range of West India islands was a part of the vast range of mountains extending through North and South America, and that that between the Alleghany and Andes, by its cumbersome weight, broke the shattered arches be-

neath, and sunk into the abyss from whence it was projected, most of the caverns were closed there. When the alluvion brought by the late inundation from the north, was deposited on those islands, on the north coast of South America, on the east of Yucaton, &c. many of the subterranean channels were filled, that the flowings of the interior waters are obstructed around that extensive branch of the ocean.— Hence the tides there are lower than in most of the large bays on our sphere.

Many lakes, springs, and wells, ebb and flow as regularly as the ocean. These bodies of water and fountains, by some chasms or chinks, have communication with interior ponds or lakes, which observe the same laws as those which cause the oceans to rise.

The same may be observed of the wells which are sunk or bored in Ohio, Indiana, Illinois, &c. for salt water.

When the miners perforate the last stratum of rocks, before they come to the chasm which contains the object of their search, the waters suddenly rise many feet above the surface of the earth, and after the first impulse has subsided, the waters ebb and flow as regularly as the ocean, though not at the same periods. The cause of these wells not flowing so frequently as the ocean, is obvious on reflection.

There are vast and winding caverns far below the surface of the earth. When the first vent or communication is made to these caverns, the waters, by the pressure of the incumbent gasses, are found to rise till the fountain is in a great degree exhausted, as is likewise the rarer fluid which forced them to rise. The waters, by springs and subterranean rills, which have found a passage through mines of salt, again fill the chasm, compressing the incumbent air till it will yield no more; and as there is but one small aperture, the waters are forced up with more violence than if a greater vent was given, and it continues longer to rise, on account of the waters being constantly flowing into the reservoir beneath.

5th. As there are some islands which have not been raised by fires, but have their bases formed by the industrious coral, from our premises we should conclude, that near the coasts of such islands, the tides would not rise so high as by those which are volcanic and have chasms beneath them.

We have seen no accounts of navigators which particularly specify the height of the tides round the many islands which they have visted. But among the islands of Austral Asia, which, from their mountains and primitive rocks, are presumed to be volcanic, the

the tides are much higher than among the islands of Polynesia, some of which are coral. But the smallness of the islands of Polynesia, if they were all volcanic, would not have beneath them caverns of sufficient extent to pour forth waters in sufficient quantities to raise, in any great degree, the expanse of ocean around them.

The Carolinas and Ladrões appear, from their situation, to have been once united, and it is presumed, that they were all elevated at the same explosion or volcanic eruption; and when the propelling force subsided, they again sunk, as did the West India isles, almost filling the caverns from which they were projected. The Pelew islands may have belonged to the same range. And it is not deemed presumption to suppose, that Asacides, Queen Charlotte's, the Friendly, and Society islands, are but the summits of an extensive mass of matter once elevated from the depth of the ocean.— Lord Mulgrave's range, Barring's Musquito group, Tindall's, and Brown's range, are the remains of lands, whose foundations were not able to support them. The appearance of Fox islands indicates that they were the branch of a range of mountains, which projected from the Stony mountains, but whose arches were not so constructed as to uphold

them. All of the Sandwich isles may have received their birth at one time, and from the same cause now appear in separate piles. New Zealand, and the circumjacent isles, are presumed to have been brought to light by one impulse of nature. And many other clusters, which now appear as in scattered fragments of extensive lands, which by supreme command was caused to appear and settle in the same disorderly, but united ranges, by the same cause.

If these numerous clusters of islands arose, as has been stated, and again sunk when the force which raised them ceased to operate, they must have nearly filled the chasms from whence they were thrown. Hence but small extents of waters could be beneath them, to cause the surrounding oceans to rise when the scales would preponderate in their favour.— And examine the reports of navigators, in regard to the height of the tides among these various clusters of islands.

5th. If the tides are produced by subterranean waters being forced into the open ocean, we should suppose that there would be diverse currents in the ocean, flowing in different directions as the channels run, through which the waters were propelled.

Most of the chasms or channels through which the subterranean waters flow, are so far beneath the surface of the ocean, that their influx appears only by the sudden rise of the oceans where their waters are discharged, and in the innumerable bubbles of air which have just escaped from the dreary caverns within to the glorious light of the sun.

But in the oceans are numerous currents flowing in every direction. In some parts of the ocean, where the surface is calm, deep currents flow to the north. In other places to the south, and to every point of the compass, according to the situation of the coast adjacent to which soundings are made. In some places where the surface or upper current moves to the north, a lower current runs to the south, and so in every direction. In the Mediterranean sea, many such currents have been discovered. Such currents would be expected, if the waters are flowing from, and receding to seas and lakes beneath the continents and islands. But if dame LUNA causes and regulates the whole of them, she would have so much employment, that she could not affect so many *brains* as seem swayed by her influence.

By the mouth of two or three witnesses, shall every word be established. In some places, the mouths of the chasms or channels

leading from the interior to the exterior floods, are so near the surface of the ocean, that the currents are perceptible.

1st. Among the Orkney isles, there are two opposite currents when the tides are flowing. One runs from the north-west, and the other from the south east, and when they meet, "they dash their roaring billows up to the clouds, and convert the separating strait into an enormous mass of foam." It is evident that these currents must flow from subterranean caverns beneath the islands, and their outlets are opposite to each other, and so near the surface, that their mists and spray are thrown high in the air.

2d. The Maalstrom, a vast vortex in the Atlantic, west of Norway, is our second witness. This vortex or whirlpool is several miles in diameter, and its current is so powerful, that when vessels or whales come within its influence they cannot be rescued from its devouring jaws; and are immediately consigned to destruction. When the tides rise again, their shattered remains or fragments are thrown out and cover the ocean. Had the mouth of this cavern been several hundred feet lower from the surface of the ocean, the whirl on the surface would not have been produced, and thou-

sands, of greater extent than that, may exist too deep for human discovery.

3d. The third witness is Scylla, which has been mentioned, whose devouring jaws cannot be better described than Virgil has done it.

The sudden rise of waters during earthquakes, induces us to believe that there are vast caverns filled with waters beneath lands, and that those waters are greatly agitated and driven from their retreats by an incumbent fluid; during the convulsions of nature.

The atmosphere filling the upper part of these caverns becomes rarefied; and struggling against its barriers, bursts the solid strata which confine it, and torrents of waters are forced through the yawning chasms. At such periods though the exterior ocean is compressed to its lowest state, yet instantly it is compelled to flow, and waves in mountainous height are driven over lands far above the approach of the highest tides. In such calamities, cities have often been swallowed in the opening chasms, sunk with the lands on which they rested, or been overwhelmed by the irresistible surges. At such a crisis vessels are driven from harbours, dashed against the precipices, or whirled by eddying billows over the remains of ruined cities.

There are phenomena of the oceans called counter tides. These are sudden rises of water near the coasts when the moon is in the opposite hemisphere, and when there is no appearance of earthquakes.

These flowings are occasioned by the atmosphere in the caverns under such coasts becoming so rarefied as to press the waters from their retreats, but do not acquire force to shake and burst the surrounding strata.

These are but a few of the phenomena of nature which are easily explained by the theory we have adopted, and which by former theories have been unaccounted for.

If the moon occasions the tides by attraction, these many phenomena remain as mysteries.

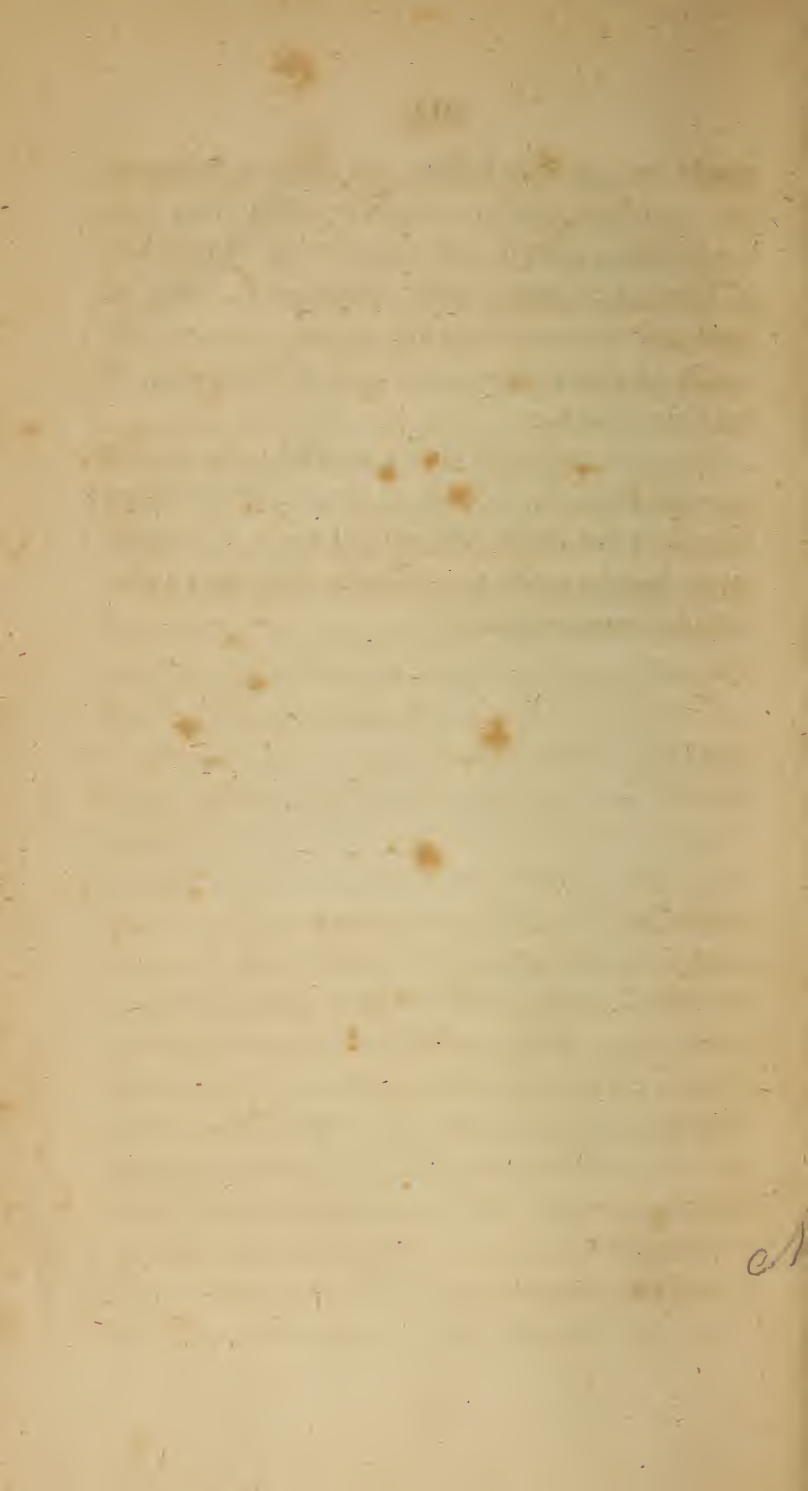
But, it will be observed, "there can be no doubt but the moon is the cause of the tides, because they flow so regularly with the moon, never varying more than an hour. The motion of the moon, is an effect of the same cause, the sun, as the tides, and it cannot be surprising that two effects of one cause should not essentially differ. Besides, would our limits permit, or would a further investigation of this subject be interesting, we would attempt to prove that were the tides produced by the attraction of the moon, the time of high tides

would not so soon follow the moon's being at the meridian; and we would explain from our theory the cause of the tides being so regular.

There are many other phenomena both of land and water, which go, as we conceive, directly to prove the correctness of the positions we have taken.

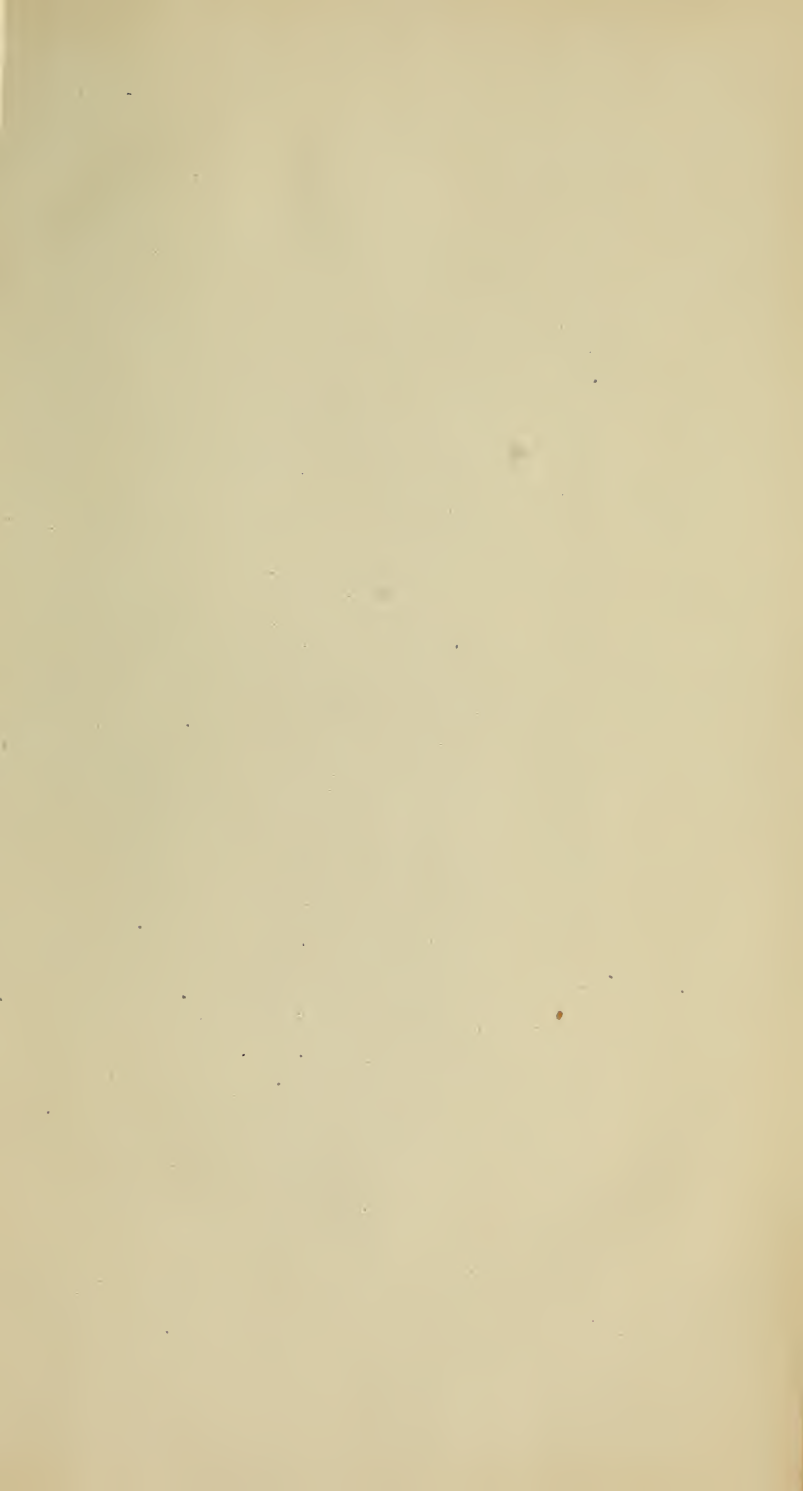
But it is believed, that enough has been said on each subject, to lead an unprejudiced mind to reflect for itself, and should more be required to convince the prejudiced, they may in future be accommodated.


THE END.



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